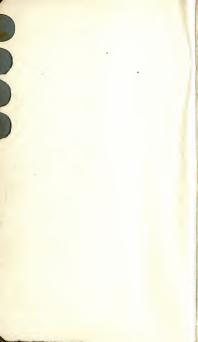
# HANDBOOK of THERAPY



# DR. CLYDE L. WELSH 626 MEDICAL ARTS BLDG. SEATTLE, .: WASH.







# Handbook of Therapy

Edited by
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CHICAGO

From the
HANDBOOK of THERAPY
by
Oliver T. Osborne and Morris Fishbein

Tenth Edition

1935

AMERICAN MEDICAL ASSOCIATION
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# Tundbook of Therapy

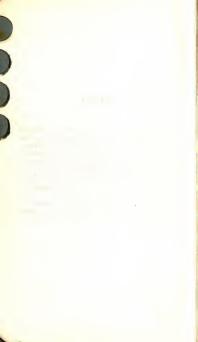
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# PREFACE

Continued progress in medicine makes a revision of this book a necessity. The first three editions of this book were compiled by collecting the articles on therapeutics written by Dr. Oliver T. Osborne, and published in THE JOUNAML of the American Medical Association. The next five editions were edited jointly by Dr. Osborne and Dr. Fishbein. The last edition, and this, the tenth revision of this book, have been prepared by Dr. Morris Fishbein, who has been aided in the compilation of the newer material by Dr. William I. Fishbein. Appreciation is also accorded to Anna Mantel for revisions of style and presentation of the material. Jan. 1, 1935

Jan. 1, 1935



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# PRESCRIPTION WRITING

Official Preparations and Useful Drugs, 13—Synonyms, 17—Thermometric Equivalents, 17—Weights and Measures, 18—Incompatibility, 21—The Harrison Narcotic Law, 22—Latin, 23—Dosage, 24—Methods of Administering Drugs, 27—Classification of Drugs, 29.

#### INTRODUCTION

Correct prescription writing is a close corollary to good therapeutics. Therapeutics is the ultimate aim of the science and practice of medicine. It includes not only drug therapy, to which its definition is so often erroneously limited, but also everything that has to do with the treatment of disease, the management of the patient, his convalescence, his permanent return to health, and the protection of the well against disease.

#### THE MANAGEMENT OF DISEASE

The administration of drugs is only a small part of the successful management of disease. Successful management demands all the physiologic, chemical, anatomic, pathologic, bacteriologic and pharmacologic knowledge that can be obtained. It includes necessary hygienic changes, perhaps a change of climate, an arrangement of the food and drink, physical treatment if indicated, such mental treatment as is advisable, such medicinal treatment as is needed and necessary operative procedures. Altogether this is therapeutics. The subject of therapeutics is, then, the broadest and the hardest one for the medical student to grasp, and it is safe to say that the young graduate in medicine, even after a hospital course, is less prepared in the bedside and office management of disease than in any other branch of his art.

#### PSYCHOTHERAPY

A proper understanding of the ability of the mind to overcome many nervous disorders, to prevent the misinterpretation of, and the exaggeration of, slight physical disturbances should be encouraged. Rational therapeutics does not limit the physician to any one form of treatment; it encourages him to use every means which may benefit his patient.

#### PRESCRIBING PROPRIETARIES

While simplicity in prescription writing is advisable, the art of combining drugs or of rendering a drug less disagreeable should be studied and practiced until efficiency is secured. It is not justifiable for a physician to belittle his profession and forget rationality in his treatment of a patient by ordering secret or irrational proprietary mixtures. The physician who orders such preparations does not realize the positive harm he often does his patients. It is not reputable, or scientific, or just to patients to prescribe preparations the ingredients of which the physician does not know.

#### PHARMACOPEIA AND NATIONAL FORMULARY

Few physicians know the range and compass of these books. Every physician can select from them the few formulas he may need that will be as elegant and pleasant methods of giving drugs as proprietary preparations and, moreover, will represent guaranteed doses of the various ingredients of the formulas selected. While the use of some of the ready-made preparations is advised, it should be understood that it is much better to combine one's own prescription to fit the individual case.

#### USEFUL DRUGS

Useful Drugs describes the action and use of drugs that have positive therapeutic value; it is prepared under the direction and supervision of the Council on Pharmacy and Chemistry of the American Medical Association. It is intended to meet the demand for a less extensive materia medica and especially to serve as a basis for the teaching of materia medica and therapeutics and for examinations on these subjects by state licensing boards. It contains an especially selected list of valuable preparations, chosen from the vast number included in the Pharmacopeia and New and Nonofficial Remedies.

#### NEW AND NONOFFICIAL REMEDIES

The physician should be ever ready to make use of a valuable discovery, but never to further fraud. A new drug should be ordered straight or used only in prescribed combinations. New and Nonofficial Remedies is a book containing a list of new remedies not in the Pharmacopeia, with a description of their preparation, their action and dosage. It is issued annually under the direction of the Council on Pharmacy and Chemistry. It enables the physician to know what proprietary preparations are reliable.

#### OFFICIAL PREPARATIONS AND USEFUL DRUGS

The principal preparations of the United States Pharmacopeia may be classified as follows:

- 1. Solids mostly for internal use:
  - A. Extracts (extracta).
    - B. Pills (pilulae).
    - C. Powders (pulveres)
  - 2. Liquids mostly for internal use:
    - A. Waters (aquae).
      - B. Elixirs (elixira).
    - C. Emulsions (emulsa).
    - D. Fluidextracts (fluidextracta).
    - E. Infusions (infusa).
    - F. Liquors (liquores).
    - G. Mixtures (misturae)
    - H. Spirits (spiritus).
    - I. Syrups (syrupi).
  - J. Tinctures (tincturae).
- 3. Semisolids for external use:
  - A. Cerates (cerata).
  - B. Ointments (unquenta)
- 4. Liquids for external use:
  - A. Liniments (linimenta).
  - B. Some waters (aquae). C. Some liquors (liquores).
  - D. Some tinctures (tincturae).

#### 1. Solids Mostly for Internal Use

A. Extracts are concentrated preparations of a drug, and are mostly moist and sticky. A few extracts are dry. They should be prescribed in pill or capsule.

The most important are:

Extractum belladonnae
Extractum cascarae sagradae
Extractum fellis boyis

Dose, 0.015 Gm., or gr. 1/4 Dose, 0.30 Gm., or gr. v Dose, 0.4 Gm., or gr. vi

B. Official pills are ready-made preparations, and consequently it should be remembered that they may deteriorate or become more or less insoluble.

The following pills have been much used.

Blaud's pills (pilulae ferri carbonatis) contain 0.06 Gm. (1 grain) of iron. Should be fresh. Dose, 1 pill. Pills of aloes (pilulae aloes) contain 0.13 Gm. (2 grains)

of aloes. Dose, 1 or 2 pills.

Compound rhubarb pills (pilulae rhei compositae) contain rhubarb 0.13 Gm. (2 grains); aloes 0.10 Gm. (1½ grains); myrrh 0.06 Gm. (1 grain). Dose, 1 or 2 pills. (U. S. P. IX)

C. Official powders are dry preparations of two or more drugs. It is better to order a powder by its official title, but below are the common names and the ingredients of the most used of these preparations:

Dover's powder (pulvis ipecacuanhae et opii) contains 10 per cent each of ipecac and opium. Dose, 0.3 Gm. (or 5 grains).

Compound jalap powder (pulvis jalapae compositus) contains 35 per cent of jalap and 65 per cent of potassium bitartrate. Dose, 2 Gm. (or 30 grains).

Compound licorice powder (pulvis glycyrrhizae compositus) contains 18 per cent of senna; 23 per cent of glycyrrhiza; 8 per cent of sulphur. Dose, 4 Gm. (or 1 drachm).

Seidlitz powder (pulvis effervescense compositus) consists of two powders; one of Rochelle salt and sodium bicarbonate in blue paper, and the other of tartaric acid in white paper. Dose, the contents of one white and one blue paper dissolved in a glass of water.

#### 2. Liquids Mostly for Internal Use

A. Waters are solutions of volatile substances in water; mostly weak preparations. (Exception, ammonia waters.)

H. Spirits are solutions of volatile substances in alcohol; mostly strong preparations. (Exception, sweet spiritis of niter.)

F. Liquors are solutions of nonvolatile substances in water; mostly weak preparations. (Exceptions, the arsenic solutions and those for external use.)

J. Tinctures are solutions of nonvolatile substances in alcohol; mostly strong preparations. (Exceptions are the aromatic and some bitter drug tinctures.)

#### A. Much used waters are:

Aqua ammoniae. Aqua camphorae. Aqua cinnamomi.

Aqua menthae piperitae.

H. Some of the commonly used spirits are:

Spiritus ammoniae aromaticus.

Spiritus camphorae. Spiritus chloroformi.

Spiritus glycerylis nitratis.

Spiritus menthae piperitae (essence of peppermint).

F. Some of the commonly used liquors are:

Liquor calcii hydroxidi (lime water).

Liquor cresolis compositus. Liquor formaldehydi.

Liquor hydrogenii dioxidi,

Liquor magnesii citratis. Liquor pituitarii.

Liquor potassi arsenitis (Fowler's solution).

Liquor sodae chlorinatae (Labarraque's solution).

J. The most used tinctures are:

Tinctura aconiti.

Tinctura benzoini, Tinctura capsici,

Tinctura cardamomi.

Tinctura cinchonae. Tinctura colchici.

Tinctura digitalis. Tinctura ferri chloridi.

Tinctura gentianae composita,

Tinctura hyoscyami.

Tinctura iodi. Tinctura lobeliae.

Tinctura myrrhae.

Tinctura nucis vomicae.
Tinctura opii and tinctura opii camphorata.

Tinctura rhei aromatica. Tinctura strophanthi.

Tinctura zingiberis.

- B. Elixirs are weak, sweetened, liquid preparations containing alcohol.
- C. Emulsions are liquid preparations representing a suspended oil or resin.
- D. Fluidextracts are liquids representing exact strengths of the drugs; i. e., 1 cc. (15 minims) contains the medicinal properties of 1 Gm. (15 grains) of the drug.
  - D. The most important fluidextracts are:

Fluidextractum cascarae sagradae.

Fluidextractum cascarae sagradae aromaticum.

Fluidextractum ergotae. Fluidextractum glycerrhizae.

Fluidextractum gryceri

- E. Infusions are weak watery preparations. One only is of value, viz., infusum digitalis.
- G. Mixtures are liquids containing more than one drug, one of which may be insoluble.

Examples are:

Brown mixture (mistura glycyrrhizae composita). Chalk mixture (mistura cretae).

The National Formulary contains a long list of mixtures.

I. Syrups are very sweet watery solutions of one or more drugs. These weak preparations are prescribed too frequently, as they readily cause disturbance of the stomach, and do not often modify a bad-tasting drug, but may even protract the taste. Sweet cough syrups are an abomination. Some much used syrups are:

Syrupus.

Syrupus ferri iodidi. Syrupus ipecacuanhae,

Syrupus pruni virginianae. Syrupus rhei aromaticus.

Syrupus sennae,

Syrupus tolutanus.

# 3. Semisolids for External Use

A. and B. The principal difference between cerates and ointments is their melting points. The ointments contain more lard or petroleum fat and less wax than the cerates; hence they have a lower melting point than the latter. Cerates do not melt when applied to the skin. The following ointments are much used:

Unguentum acidi borici.
Unguentum belladonnae.
Unguentum chrysarohini.
Unguentum hydrargyri fortius.
Unguentum hydrargyri ammoniatum.
Unguentum hydrargyri mite.

Unguentum hydrargyri oxidi flavi. Unguentum picis pini. Unguentum sulphuris.

Unguentum zinci oxidi.

### 4. Liquids for External Use

Some waters, some liquors, some tinctures and the liminents, as the name implies, are used externally only. Most of the liniments are stimulating to the skin, only two being sedative, viz., the belladonna liniment and the carron oil (liminentum calis).

#### SYNONYMS

The following are the ones most frequently used: BASHAN'S MIXTURE, Liquor ferri et ammonii acetatis, U. S. P. BLAUD'S PILL, Pilula ferri carhonatis, U. S. P. BLEACHING POWDER, Calx chlorinata, U. S. P. BLUE MASS, Massa hydrargyri, U. S. P. BLUE OINTMENT, Unguentum hydrargyri mite, U. S. P. BLUE VITRIOL, Cupri sulphas, U. S. P. BROWN MIXTURE, Mistura glycyrrhigae composita, U. S. P. CARRON OIL, Linimentum calcis, U. S. P.
Dobell's Solution, Liquor sodil horatis compositus, N. F. Donovan's Solution, Liquor arseni et hydrargyri iodidi, U. S. P. DOVER'S POWDER, Pulvis ipecacuanhae et opii, U. S. P. EPSOM SALT, Magnesii sulphas, U. S. P. FOWLER'S SOLUTION, Liquor potassi arsenitis, U. S. P. GLAUBER SALT, Sodii sulphas, U. S. P. HIVE SYRUP, Syrupus scillae compositus, U. S. P. HUXHAM'S TINCTURE, Tinctura cinchonae composita, U. S. P. LABARRAQUE'S SOLUTION, Liquor sodae chlorinatae, U. S. P. LUGOL'S SOLUTION, Liquor iedi compositus, U. S. P. LUNAR CAUSTIC, Argenti nitras fusus, U. S. P. SUGAR OF LEAD, Plumbi acetas, U. S. P. VALLET'S MASS, Massa ferri carbonatis, U. S. P. WARBURG'S PILL, Pilula antiperiodica, N. F. WARBURG'S TINCTURE, Tinctura antiperiodica, N. F.

#### THERMOMETRIC EQUIVALENTS

To convert degrees Centigrade to degrees Fahrenheit, multiply by 9, divide by 5, and add 32 to the quotient. To convert degrees Fahrenheit to degrees Centrigrade, subtract

32, multiply by 5 and divide by 9. A few commonly used equivalents are as follows:

C. F. 0 = +32 Freezing point of water. 37 = 98.6 Normal body temperature. 40 = 104

60 = 140 Sterilizing and pasteurizing temperature. 00 = 212 Boiling point.

#### WEIGHTS AND MEASURES

It is not necessary to describe here the old system or to give its tables of weights and measures, as they occur in every book on prescription writing, but some tables of approximate equivalents to the metric system will be offered. Exact equivalent tables are a delusion and only tend to befog and discredit the metric system. When it is remembered how the dose of drugs vary, it will be recognized how absurd it is to figure an equivalent to its finer determinations.

It is not necessary to declare that the decimal (metric) system of prescription writing is the better, because the fact is recognized by all and the only hindrance to its use is the supposed difficulty of mastering it. Science of all countries has adopted it—even our own Pharmacopia. If the novice in the use of the metric system in prescription writing will remember that it is a decimal system like our monetary system, that everything on the left of the decimal point or line represents grams or cubic centimeters [foldiars], that everything on the right of the decimal line represents centigrams, milligrams, or fractions of a cubic centimeter [cents and mills], he will soon understand the system.

In this country it is customary in writing prescriptions in the metric system to write for solids in terms of grams and fractions of grams, and for liquids in terms of cubic centimeters or fractions of cubic centimeters. The same decimal line which should be ruled on the prescription blank answers for both solid and liquid metric measures, and precludes all possibility of careless decimal mistakes, as:

It is best to use in prescribing only two denominations, grams and milligrams. Liquids, of course, are expressed as cubic centimeters.

The Abbroximate Equivalents in the Two Systems

	Gm. or Cc.	
	grain (gr.i) = approximately 0]065	= 1 grain.
1	minim (mi) = approximately 0 065	bic centimeter = 1 minim.
	grains (gr.xv) = approximately 1	= 1 gram = 15 grains.
	minims (mxv) = approximately 1	= 1 cubic centi- meter = 15 minims.
	drachm (3i) = approximately 4	= 4 grame = 1 drachm.
	fluidrachm (fl.3i) = approximately 4	= 4 cubic centi- meters = 1 fluidrachm.
	ounce (3i) = approximately30	= 30 grams = 1
1	fluidounce (fl.3i) = approximately.30	= 30 cubic centi- meters = 1 fluidounce.

1 quart = approximately 1,000 cc., or 1 liter. 1 pint = approximately 500 cc.

= approximately 1 teaspoonful 5 00

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As has been said, it is useless to translate the old system into exact equivalents of the new system. One must compute the doses in the new system; one must forget the size of stock bottles and order amounts of liquids in multiples of five, as 15 cc., 25 cc., 50 cc., 100 cc., or 200 cc.; one must remember that 5 cc, is a teaspoonful dose, i. e., an ordinary teaspoon holds 5 cc. and not 4 cc. or a liquid drachm; in other words, every prescriber in the old system has always given a larger dose than he intended when he computed the dose by fluidrachms and then administered a teaspoonful; one should remember that the drop, so much used in prescribing strong liquid preparations, is as correct in the new system as in the old. All of these suggestions must be followed out to use the metric system successfully.

Stub (one does)

It is always a good plan to use a stub prescription blank, and on the stub the individual doses may be written. This is another check on mistakes and also preserves for reference the exact dose given on the exact date, as:

Stub (one dose)	r rescription for 20 doses	
B. Strych, sulph.  001 Ferri reducti.  05 Quin. sulph.  10 M. et F. cap.	B Gm. or Cc. syst. Strychninae sulphatis   02 gr. x Quininae sulphatis   2 gr. x Quininae sulphatis   2 gr. x M. et F. capsulas 20.	v x
Sig.: t. i. d., p. c. Name. Age. Date.	Sig.: A capsule 3 times a day, af meals.	ter
Or, Stub (one dose)	Prescription for 20 doses	
В	B or Cc. syste	m
Codein. sulph01 Ammon. chlor25 Syr. acid. cit 1.25 Aquae q. sad 5. M. Sig.: 5 cc. q. 2 h. in H.O.	Codeinae sulphatis.   20 gr.iv Ammonii chloridi. 5 šiss Syrupi acidi citrici. 25 fl.ši Aquae q. s	v
	B. Strych, sulph. [001 Ferri reducti. [05 Quin. sulph. [10] M. et F. cap. Sig.: t. i. d., p. c. Name. Date. Or, Stub (one dose) B Codein. sulph 91 Ammon. chlor. 25 Syr. add. cit 125 Ame. q. s d 5 Syr. add. cit 125 Syr. add. cit	B Gm. Of Cc. system.

Shake It is better to use the arabic numerals instead of the roman in the new system, as:

Pilulas rhei compositas No. 20 Sig.: One pill after supper.

Stub (single dose) Prescription Gm. Old or Cc system Tr. digitalis. Tincturae digitalis... 25| or Sig.: 10 drops in H<sub>2</sub>O b. i. d., p. c. Sig.: Ten drops, in water, twice a day, after meals.

Stub	Preso	ription	
B. Ung. hg. ammon. Petrolatiāā 10 M. Sig.: Externally.	B. Unguenti hydrargyri ammoniati	10	Old system ää šiiss

#### INCOMPATIBILITY

Incompatibility is prevented only by great care and simplicity. Too many drugs should not be prescribed. Too many solutions should not be combined. Too many drugs and too much medicine should not be given to one patient on any one or two days. Many drugs are cumulative and many of their physiologic activities are antagonistic. Drugs may be incompatible therapeutically, chemically and pharmaceutically.

Therapeutic incompatibility occurs when drugs are combined which have antagonistic physiologic actions.

Chemical incompatibility occurs when from the combination of two or more drugs a new and undesired chemical compound results.

Pharmaceutic incompatibility occurs when drugs are combined which form, either immediately or later, cloudy, precipitated or decomposed solutions.

An educated physician should be ashanied to perpetrate a therapeutic incompatibility either in a prescription or in a patient. It is not therapeutic incompatibility, however, to modify a too decided action of a drug with one that corrects an undesired effect. This is a part of therapeutic science.

Pharmaceutic incompatibility is so closely related to chemical incompatibility that many times both are governed by the same rule. Such incompatibility is difficult to avoid, and therefore it is advisable to adopt simplicity in prescription writing; this is really a therapeutic gain.

The following is an alphabetical list of drugs which should generally be given alone, especially in solutions. The chemical reasons are appended:

Acids, unless very dilute and in small amount, should be prescribed alone. They combine with bases to form salts, and are incompatible with oxids, alkalis, alkaline salts, hydrates and carbonates. They usually precipitate albumin.

Alkalis and alkaline carbonates should rarely be prescribed in solutions with other drugs. They form salts with acids and precipitate many metallic and alkaloidal salts.

Alkaloidal salts should rarely be combined with other drugs in solutions. They are precipitated by alkalis, alkaline carbonates, earthy carbonates, preparations containing tannic acid, and by iodides in solution.

Arsenic (arseni trioxidum, arsenious acid) should generally be prescribed in solutions alone.

It is precipitated by salts of iron, magnesia, and solutions of lime.

Bromides in solution should not be combined with alkaloids. They precipitate the salts of morphine, quinine, and strychnine from neutral solutions

Ferric and ferrous salts should generally be prescribed alone. They are incompatible with tannic acid and all drugs containing it; with alkaline carbonates, ammonia, and acacia.

Iodides should generally be prescribed alone.

They are incompatible with salts of alkaloids and metals and with mineral acids.

Mercuric chloride (corrosive sublimate) should generally be prescribed alone. It is incompatible with many drugs.

Mercurous chloride (calomel), though insoluble, had best not be prescribed in mixtures. In solutions containing chlorides it may be converted into the mercuric salt.

Resins, including oleoresins, fluidextracts and tinctures containing resins, should not be prescribed in watery solutions, though they may be ordered in emulsion by suspending them with the mucilage of acacia or tragacanth.

They are all precipitated by water.

Silver nitrate solutions and solutions of all silver salts must be ordered alone, and kept in dark bottles.

Strophanthus in the form of the tincture should not be prescribed in solutions containing water.

Spirits (spiritus) should not be prescribed with watery preparations. They become cloudy on the addition of water.

Tannic acid, and all drugs containing tannic acids, should not be prescribed with most drugs. They are incompatible with alkaloids, salts of iron, lead, silver and antimony.

#### THE HARRISON NARCOTIC LAW

This law affects the physician both as a prescriber and as a dispenser of drugs. It requires the prescribing physician to register with the collector of internal revenue of the district. In writing a prescription for narotic or habit-forming drugs, coming under this act, the physician must write thereon the name and address of the patient, and must have on the prescription his office address and his registry number. He must date the prescription and sign his name in full. He is not required to keep either copies or records of prescriptions; this is done by the druggist. It is,

however, advisable to retain copies of all prescriptions.

These prescriptions cannot be refilled.

If the physician desires any of the specified drugs, for his own use, he must make out an order for them on a blank form bearing his registry number. These blanks may be secured from the Internal Revenue Department. The physician cannot order drugs for his own use on a prescription blank

When he dispenses, the physician assumes the work of the druggist and is subject to the same rules. He must keep a record in a suitable book of the names and addresses of the patients to whom habit-forming drugs are given. He must also record the date and the amount given. Such treatments as he may personally administer or cause to be administered when away from his office need not be recorded.

#### LATIN

As Latin is no longer required for matriculation by many medical schools it is unwise to attempt to outline the correct use of Latin in prescriptions. Prescriptions are well written in English with the United States Pharmacopeia Latin names or with the official abbreviations. However, the Latin abbreviations should be used and a few are listed here with a statement of their meanings.

#### Abbreviations Totio

Abbramiation

āā	ana (Greek)	of each
ad	ad	up to
b. i. d.	bis in die	twice a day
cap.	capsula,—ae.	a capsule
co. or comp.	compositus-a-um	compound
div.	divide	divide
ext.	extractum.—i	
fae	fac	an extract
flext.		make
	fluidextractum,-i,	a fluid extract
gtt.	gutta,—ae	drop or drops
liq.	liquor.—is.	a solution
m.	misce	mix
mist.	mistura,-ae	a mixture
p. c.	post cihum	after food
pil.	pilula,—ae	a pill
pulv.	pulvis,—eris	
q. s.	pulvis,—ells	a powder
55.	quantum sufficit	a sufficient quantit
39.	semis, semissis	a half
sig.	signa	write
sol.	solutio,—onis	a solution
spts.	8piritus	a spirit
t. i. d.	ter in die	three times a day
tr.	tinctura,-ac	a tincture

#### DOSAGE

The dose of a drug should be based on the age, weight and individuality of the patient, and the necessity for a strong action of the drug.

The frequency of the dose is determined by the results obtained, by the length of time it takes the drug to be eliminated or to cease its action, and by the

possibility of its causing a cumulative effect.

While age is an all-important element in the determination of the dose, the weight, unless in the obese, is the most important element, except in the case of narcotics given to children. Children have more central nervous system as compared to their weight than adults, and therefore are more profoundly affected by drugs which act on the brain than are adults. In other words, a given dose of a narcotic, especially of the opium series, for an adult must be more reduced in size for a young child than any table of reduction computed by age or weight would determine.

The best simple rule of dosage by age is the fol-

lowing:

At 20 years, the adult dose. At 10 years, 1/2 the age, 1/2 the dose.

At 5 years, 1/4 the age, 1/4 the dose.

At 21/4 years, 1/4 the age, 1/4 the dose.

At 1 year, 1/12 the dose.

1 1 Jean, /12 the dose.

Children whose ages are between the ones here specified may readily be prescribed doses a little more or less than the dose determined by the age nearest theirs in the table.

The relation of size and weight to the dose is all-important. A large child of 2 years should certainly receive a larger dose than a weakly, small child of the same age. Also a small adult of 20 should receive less than a large muscular individual of the same age. The blood of an adult represents about one thirteenth of his total weight. This is not true of children or of the obese. Hence the dose for an obese individual may be even less than if his weight were normal.

The following are the average weights for normal adult males. It should be remembered that females up to the age of 45 or 50 generally weigh less than males; also that a range of from 25 to 30 pounds above or below the average weight, the patient's general con-

dition being good, is not considered a weight too high or too low for acceptance as an insurance risk. Above or below this range of 25 to 30 pounds from the average is generally considered overweight or underweight, and the acceptance of such an individual for insurance becomes questionable.

Average Weight to Height at Different Ages

					car			
Ft. In.	15-24	25-29	30-34	35-39	40-44	45-49	50-54	55-60
5-0	120	125	128	131	133	134	134	134
5-1	122	126	129	131	134	136	136	136
5-2	124	128	131	133	136	138	138	138
5-3	127	131	134	136	139	141	141	141
5-4	131	135	138	140	143	144	145	145
5-5	134	138	141	143	146	147	149	149
5-6	138	142	145	147	150	151	153	153
5-7	142	147	150	152	155	156	158	158
5-8	146	151	154	157	160	161	163	163
5-9	150	155	159	162	165	166	167	168
5-10	154	159	164	167	170	171	172	173
5-11	159	164	169	173	175	177	177	178
6-0	165	170	175	179	180	183	182	183
6-1	170	177	181	185	186	189	188	189
6-2	176	184	188	192	194	196	194	194
6-3	181	190	195	200	203	204	201	198

In determining the dose it is most important to consider whether or not the patient has any exceptional susceptibility to the given drug. When an idiosyncrasy or abnormal susceptibility to a certain drug or to drugs of a certain class is known, the drugs causing it should, if possible, not be administered. Hypersensitization, termed anaphylaxis, is a cause of idiosyncrasy to some drugs.

Sometimes such undesired action of a drug occurs with the first dose only, notably in the case of quinine, and a tolerance to the drug is, after this first dose, temporarily acquired.

A patient may, on the other hand, be abnormally tolerant to a given drug, so that unusually large doses are necessary to cause an effect.

Still other very important modifications of the dose are caused by disease, by the condition of the patient's digestive and absorptive system, and by the condition of his eliminative organs. The disease present may create a tolerance or an increased susceptibility to a drug. Slow absorptive powers may render the action of the drug almost impossible or allow

accumulation of dangerous amounts of the drug (under which conditions the drug should be given hypodermically, if it is needed). Slow or retarded elimination due to defective eliminative organs will allow accumulative action of many drugs.

The drugs which are most frequently found unexpectedly to cause undesirable or even serious symptoms in susceptible individuals are quinine, salicylates, atropine-containing drugs, iodine-containing drugs, and

opium and its alkaloids.

The diseased conditions that most modify (lessen) the dose of a drug are nephritis and cirrhosis of the liver.

A condition of shock precludes immediate absorption from the stomach; hence such a condition must be combated, if by drugs, hypodermically.

#### Frequency of the Dose

It should be carefully learned how long, ordinarily, it takes a given dose of a drug to act, and how long before most of it is eliminated. This determines the frequency of the dose. Some drugs are eliminated so slowly that they tend to accumulate in the system or are deposited in the various organs so that medication may occur days and even weeks after the cessation of the administration of the drug.

A few of the rapidly acting drugs are:

Alcohol Iodides
Ammonia Salicylates
Camphor Strophanthin
Caffeine Strychnine

These act in a few minutes to an hour or so; hence the intervals at which they may be given range from every hour to every three hours, or three times a day, according to the drug.

A few of the slowly acting drugs are:

Arsenic Quinine
Atropine Synthetic antipyretics
Bromides Synthetic hypnotics
Digitalis Thyroid preparations
Mercury

These act in from several hours to twenty, and hence should be given only once or twice a day, according to the drug.

A few of the drugs that tend to accumulate in the system are:

Areonic

Atropine Bromides Digitalis Mercury Strychnine

Many drugs cause eruption on the skin either due to irritation of the stomach and duodenum or to their excretion by the skin which irritates the glands, or they cause flushing of the skin.

Examples of drugs causing the first kind of irritation are: copaiba, chloral, opium, quinine, salicylates, synthetic compounds, volatile oils; drugs of the second type are arsenic, bromides and iodides; those of the third type are antitoxin, atropine and thyroid.

It should always be remembered that some drugs are excreted into the milk; hence if the mother is nursing her baby, some drugs should be avoided, and some given only infrequently; or, on the other hand. the baby may be medicated through the mother.

Generally speaking, most narcotics (opium, bromides), most metals and endocrine gland extracts (arsenic, mercury, iodides, thyroid preparations), most

cathartics and quinine are excreted in the milk.

## METHODS OF ADMINISTERING DRIGS.

Drugs and serums are more than occasionally administered intravenously. As the technic requires skill and most perfect asepsis, this method should not frequently be resorted to. Moreover, when a drug or serum is injected intramuscularly, the rate of absorption and activity are almost as rapid as when it is given intravenously, and the danger of accidents is much less.

The hypodermic or subcutaneous method is of very great value in all emergencies, but should not be used too frequently. Of course, the most frequent need for such medication is caused by pain, which must be combated by morphine or its equivalent. The danger of acquiring a habit is greater when the drug is used hypodermically than when it is given in any other way.

The usual method of giving a drug is by the mouth. in liquid, powder, pill, cachet, capsule or tablet form. A drug will act more quickly if given in liquid solution on an empty stomach. If it is disagreeable, however, it should be given in a capsule if the character and dose of the drug will allow. If a drug is irritant, it should not be given on an empty stomach. A disagreeable liquid drug should not be combined with a syrup, which does nothing but prolong the taste and unset the stomach. It should be given in plain water to be followed by any kind of taste the patient prefers, such as orange, lemon, or by a peppermint or wintergreen candy, for example. Or the liquid may be given in a sour mixture, as lemonade or syrup of citric acid and water, or in a mineral or carbonated water. A powder may be given in milk or in an effervescing water

Cansules are the best means of giving drugs disagreeable in taste and small in dose. The contents of a capsule should be dry for rapid solution, the principal advantage of a capsule over a pill. If rapid action is desired, or if it is feared that the capsule, slowly dissolving on a small part of the mucous membrane of the stomach, will irritate the membrane, the capsule may be uncapped at the moment of swallowing, and the result is the same in the stomach as though the drug had been taken as a powder. Alcohol in any form in the stomach will retard the solution of a gelatin capsule. Pills are not as much used as before the capsule became so popular. The solution and absorption of a pill must be slow, unless it contains some particles of a substance that swells with water, as starch. Sugar, chocolate, or gelatin-coated pills and tablets make the solution still slower, though in the case of drugs to act on the intestine this may be of advantage.

The much used tablet, compressed or triturate, doubtless renders much medication valueless, and perhaps, and perhaps, fortunately, harmless. The speed of solution of most tablets on the market is problematic; hence if the action of a tablet is immediately desired it should be predissolved, or at least crushed by the teeth before swallowing. All antipyretic coal tar tablets should be crushed before swallowing and taken with plenty of water. It should not be forgotten that anything that may burn or irritate the membrane of the mouth will do the same to the mucous membrane of the stomach. Hence bromide tablets should never be taken undissolved. Potassium chlorate tablets dissolved in the mouth or swallowed are dangerous. Potassium chlorate solutions for the mouth and throat are valuable, but there is no justification for ever taking potassium chlorate into the stomach or into the system.

A very soluble tablet dissolved and absorbed from the mouth will give almost as rapid action as when given hypodermically.

The rectum absorbs drugs given by means of suppositories or injections nearly and sometimes quite as rapidly as does the stomach. Sedatives and some laxatives only are administered by suppositories for systemic effect.

A few drugs are given endermically, but except in the case of mercury the method is uncertain.

Mucous membranes may be treated by douching, injection and insuffiation, and those of the air passages by inhalation. Some drugs are absorbed by all of these methods, and if poisonous drugs are used, the possibility of too great an absorption must always be kept in mind.

## CLASSIFICATION OF DRUGS

While dictionaries and encyclopedias must be arranged alphabetically for ready reference, alphabetic arrangement of drugs for the practicing physician is very unsatisfactory. For a practicing physician, classification based on chemical constituency, pharmacologic peculiarities, or toxic action is absolutely of no value. A drug may have a chemical, physiologic or toxic activity that is of no value from a therapeutic standpoint. The classification always of value and always necessary for the practicing physician is one based on therapeutic uses.

The following classification selects certain drugs for certain therapeutic indications. While this enumeration of drugs does not comprise all that are of value it does comprise the best, and any drug that aspires to a place in such a classification must show positive physiologic activity and therapeutic success to prove that it should be classed among these, the best drugs.

 Drugs Applied for Their Local Action on the Skin, Wounds or Visible Mucous Membranes.

Corrosives or Caustics.—Glacial acetic acid, nitric acid, alum, silver nitrate, phenol, potassium hydroxide, sodium hydroxide, zinc chloride.

Disinfectants and Antiseptics.—Boric and salicylic acids, silver nitrate, chloride of lime, cresol, formaldehyde. mercuric chloride, mercuric iodide, mercurochrome, hydrogen peroxide solution, phenol, potassium permaneanate, sulphur, and thymol.

Astringents.—Tannic acid, alcohol, alum, bismuth subcarbonate, subgallate and subnitrate, copper sulphate, iron chloride and sulphate, zinc oxide and sulphate.

Styptics.-Soluble astringents, iron chloride and alum.

To Contract Vessels .- Epinephrine.

Emollients: Powders.—Starch, bismuth subcarbonate and subnitrate, magnesium carbonate, talcum, zinc oxide.

Protectives.—Lard, wool fat, white wax, collodion, fixed oils and netrolatum.

Local Anodynes and Analgesics for Pain and Itchings.—
Ammonia water, atropine, chloroform, cocaine phenol.

Local Anesthetics.—Ether, ethyl chloride, cocaine, menthol, procaine and quinine and urea hydrochloride.

II. DRUGS USED FOR DISEASES OF THE ALIMENTARY TRACT.

Mouth and Threat.

Demulcent.—Acacia, glycerin and potassium chlorate solutions.

To Lessen Salivation.-Atropine.

Stomack

Digestives .- Hydrochloric acid and pepsin.

Emetics.—Apomorphine hydrochloride, emetin hydrochloride, ipecac, mustard, sodium chloride, zinc sulphate, copper sulphate.

To Lessen Irritation and Vomiting.—Bismuth subcarbonate and subnitrate, codeine, lime water, morphine and opium.

To Lessen Acidity.—Calcium and magnesium carbonates. lime water, magnesium oxide, sodium bicarbonate.

- To Increase Secretion, Bitters.—Quinine, gentian, nux vomica, strychnine.
- Carminatives.—Alcohol, camphor, capsicum, cardamom, cloves, volatile oils, ginger.

### Intestine.

- To Promote Evacuation .--
  - Vegetable Purgatives.—Aloes, aloin, colocynth, elaterin, jalap, podophyllum, cascara, rhubarb, castor oil, senna, croton oil.
    - Saline Purgatives.—Magnesium carbonate, sulphate, oxide and citrate, potassium bitartrate, potassium and sodium tartrate, sodium phosphate and sodium sulphate
    - Mercurial Purgatives.—Calomel, mercury with chalk.

      Miscellaneous.—Fel bovis, glycerin, sulphur, petrolatum
      oil. ohenolohthalein and isacen.
- To Lessen Movement and Reflex Spasm.—Tannic acid, atropine, bismuth subcarbonate, subgallate and subnitrate, lime water, morphine and onium.
- To Destroy Parasites, Anthelmintics.—Aspidium, chloroform, calomel, pelletierin, salol, santonin, turpentine, thymol, wormseed oil.
- III. Drugs Used for Their Effects on the Circulation. Heart.
  - To Strengthen Contraction.-Digitalis, strophanthus.
  - To Accelerate Pulse .- Atropine, caffeine, camphor.
  - To Slow Pulse.-Digitalis, strophanthus.

### Vessels.

- To Contract Vessels and Raise Blood Pressure.—Epinephrine, ergot, pituitary, atropine, caffeine.
- To Relax Vessels and Lower Blood Pressure.—Amyl nitrite, nitroglycerin, sodium nitrite.
- To Remove Fluid.—Diuretics, diaphoretics, vegetable and saline purgatives. Also digitalis, calomel, squill.
- IV. Drugs Used for Their Effects on the Genito-Urinary System.
  - To Increase the Flow of Urine, Diuretics.—Caffeine, digitalis, calomel, potassium and sodium salts, squills, strophanthus, theobromine.
  - To Render the Urine Less Acid.—Potassium acetate, bicarbonate and citrate, sodium bicarbonate.

- To Render the Urine Aseptic.—Benzoic and salicylic acids, methenamine, salol, sandalwood oil, sodium benzoate, sodium salicylate.
- To Promote Menstruation, Emmenagogues.—Vegetable purgatives, corpus luteum, thyroid, pituitary.
- V. DRUGS USED FOR THEIR EFFECTS ON THE RESPIRATORY SYSTEM.
  - To Stimulate the Respiratory Center.—Atropine, caffeine. camphor, strychnine.
    - To Reduce the Irritability of the Center in Cough.—Codeine, morphine, opium.
  - To Increase and Liquefy the Bronchial Secretion.—Ipecac, potassium iodide, sodium iodide.
- To Lessen the Secretion of the Bronchi.—Ammonium chloride, atropine, morphine, quinine tonics. Also inhalations of benzoins, pines and turpentines.
- To Relax Bronchial Spasm in Asthma.—Amyl nitrite, atropine, epinephrine, nitroglycerin, potassium iodide, sodium iodide, sodium nitrite, chloral, morphine.
- VI. DRUGS USED FOR THEIR EFFECTS ON THE CENTRAL NERVOUS SYSTEM.
  - Stimulants.—(a) (the spinal cord) strychnine, (b) (the brain and medulla) atropine, caffeine and camphor.
  - Depresanti.—(a) (to paralyze sensation) ether, chloroform; i, (b) (to induce sleep and rest) alcohol, chloral, coder, morphine, opium, paraldehyde, scopolamine, sulphonal, barbital, phenobarbital; (c) (to relieve pain) acceanilid, acetphenetidin, alcohol, antipyrine, acetylsalicylic acid, chloral, codeine, morphine, sodium salicylate.
- VII. DRUGS USED TO REDUCE FEVER TEMPERATURE.
- Acetanilid, acetphenetidin, aconite, antipyrine, acetylsalicylic acid, quinine, sodium salicylate.
- VIII. DRUGS USED FOR THEIR EFFECTS ON THE LIVER.

  To Increase Bile.—Salicylates, fel boyis.
- IX Detice Hern non Their Exercise on the Ricon
  - To Increase the Hemoglobin.—Iron salts and combinations.
  - To Render the Blood More Alkaline.—Potassium acetate, bicarbonate and citrate, sodium bicarbonate and
  - To Increase the Coagulability.—Calcium salts, horse or human blood serum.

X. DRUGS USED FOR SPECIFIED DISEASES.

Malaria -- Arsenic, quinine,

Syphilis.-Mercury, iodides, arsenic, arsphenamine, Rheumatic Fever.-Salicylates.

Dibhtheria.-Serum antidiphthericum.

Diahetes -Insulin

Tetanus.-Serum antitetanicum

Trybansomiasis.-Antimony and potassium tartrate, sodium

arsanilate Gout.-Cinchophen. colchici semen.

XI. DRUGS USED FOR THEIR EFFECTS ON THE SKIN. Irritants.-Alcohol, ammonia, camphor, cantharides, capsi-

cum, menthol, mustard, turpentine, croton oil. Disinfectants or Irritants Used Chiefly in the Form of

Ointments in Parasitic Skin Diseases .- Balsam of Peru, benzoin, camphor, chrysarobin, mercury, iodine, tar, resorcin, sulphur, thymol.

To Increase Sweat .- Camphor, ipecac, opium, pilocarpine,

To Lessen Sweat,-Atropine.

cocaine, homatronine

XII. DRUGS USED LOCALLY FOR THEIR EFFECTS ON THE EVE To Dilate the Pupil and Relax Accommodation .- Atropine,

To Contract the Pubil and the Ciliary Muscle.-Physostigmine salicylate, pilocarpine, hydrochlorate,

### OTHER PROPERTIES OF WELL KNOWN DRUGS

The following classification is taken from "Introduction to Materia Medica and Pharmacology" by Oliver T. Osborne.

Drugs and Preparations Which May Cause an Eruption on, or Itching of, the Skin .- Antitoxin, arsenic, belladonna, bromide, chloral, copaiba, iodide, opium, quinine, salicylic acid. synthetic compounds, volatile oils and drugs containing them.

Drugs Which May Change the Color of the Urine:

Drugs that increase its amount cause it to be lighter. Drugs that irritate the kidneys cause it to be darker.

Methylene blue causes it to be green, if acid. Phenol may cause it to be brown.

Santonin causes it to be yellow, if acid; purple, if alkaline. Senna may cause it to be red if alkaline; yellow, if acid.

Sulphonal may cause it to be very dark.

Drugs Which Color the Feces:

Bismuth salts color them black or dark gray. Colchicum colors them greenish.

Iron colors them black.

Mercury colors them green.

Purgatives cause them to be darker.

Drugs Which Are Excreted with the Milk.—Arsenic, bromides, methenamine, iodide, lead, mercury, opium, quinine, sulphur, thyroid, vegetable cathartics, volatile oils.

## TREATMENT OF POISONING

Class I.—Irritants of the Gastro-Intestinal Canal, 35—Class II.—Irritants of the Central Nervous System, 38—Class III.—Depressants of the Nervous and Circulatory Systems, 44.

As the symptoms and treatment of poisoning are many times so similar, it seems best to divide poisons into classes, and then to describe the treatment of each class, rather than to multiply individual descriptions.

The following classification is of types of drugs. The individual drugs with references to the class to which they belong, and therefore to the treatment advisable, will be found in a table on another page.

CLASS 1.—Irritants of the Gastro-Intestinal Canal.

Alkalis. Irritant metallic salts

CLASS 2.—Irritants of the Central Nervous System.

Atropine-containing drugs.

Caffeine-containing drugs.

Scopolamine (hyoscin).

Strychnine. Volatile oils.

CLASS 3.—Depressants of the Nervous and Circulatory Systems,

All cardiac drugs in large doses. Coal tar products.

Cyanides. Hypnotics.

Narcotic drugs.

Nicotine.

Most phenol-containing drugs.

### CLASS I.—IRRITANTS OF THE GASTRO-INTESTINAL CANAL

Most irritants in weak dilutions are astringent, while most astringents in strong solutions are irritant. The action of astringents and irritants on mucous membranes is, therefore, largely one of degree. Some astringents act chemically to form albuminates with the protein substance found on moist mucous membranes, thus coating and preventing the further irritation of the membrane. At the same time the blood vessels of the membrane are contracted, the membrane is dried, and the secretion diminished. This is typical metallic astringent action. If this albuminate is insoluble or very slowly soluble in the mediums surrounding it the action just described is the only action due to the astringent, viz., there may be more or less pronounced irritation at first, but the after-effect is sedative. If, however, this albuminate tends to dissolve at its junction with the mucous membrane, the action of astringency is then continued and may become so irritating as to cause severe inflammation or with some metallic salts or acids cause ulceration and corrosion. Such drugs or preparations are called "gastro-intestinal irritants," and in poisonous doses will all produce the same immediate symptoms. Later individual symptoms or conditions develop because of the character of the substance absorbed, its chemical nature and the amount of local corrosion that it can cause.

Different metals have different powers of astringency and irritant action; also different salts of the same metal vary in the irritation which they will produce. The acid formed after the dissociation of the metallic ion decides the amount of irritation that the salt will cause. Also the greater the case with which the metallic ion is dissociated from its acid ion the greater the corrosion; therefore, the soluble nitrates and chlorides are much more corrosive than the acetates, citrates and tartrates. The sulphates are between

these groups in their irritant effect.

The most astringent metals in the order of their astringency are lead, iron, aluminum, copper, zinc and silver. The most astringent salt is lead acetate, while the most irritant salts are mercuric chloride and zinc chloride. The sulphates and acetates of copper and zinc and the nitrates of silver and lead, if applied in weak solutions, are astringent, but are irritant if in large quantities or in strong solutions. Insoluble preparations of mercury may irritate and corrode, but insoluble salts of other metals are generally only astringent.

Double salts of the metals are less likely to irritate, because they ordinarily do not precipitate albumin. A styptic strongly coagulates albumin and hence causes a clot which stops hemorrhage.

### SYMPTOMS

The symptoms common to all gastro-intestinal irritants are irritation or corrosion of the mouth, throat
and esophagus, depending on the concentration of the
poison swallowed. Other symptoms are: more or less
gastric pain; nausea; vomiting, first of the contents
of the stomach, then of mucus, then often of blood;
later diarrhea, first the contents of the bowles, then
mucus and, perhaps, blood are passed. There are
more or less symptoms of shock due to the reflex
action on the heart from irritation of the gastric
branches of the pneumogastric nerve. The symptoms
of collapse are a rapid, weak heart, dyspnea, cold surface of the body, clammy, cold perspiration, tendency
to syncope, and a gradual failure of the pulse.

The symptoms of poisoning by gastro-intestinal irritants are:

Immediate Symptoms: Pain, nausea, vomiting, colic, diarrhea and collapse.

Frequent After-Symptoms: Inflammation and ulceration of the mouth, throat and esophagus, gastritis, duodenitis (jaundice), enteritis, albuminuria, nephritis, and ulceration of the stomach, perforation, peritonitis.

Possible Remote Symptoms: Fatty degeneration of the liver, kidneys and heart; strictures after healing of the corrosions and ulcerations.

### TREATMENT OF CORROSIVE POISONING

Immediate Treatment: Warm water drinks containing the antidote, if there is one (an emetic or a stornach tube is rarely needed and, if necessary, should be used with great caution and gentleness); albuminous and muclaginous drinks, as milk, egg albumin, flax-seed infusions, slippery elm infusions, etc.; hypodermic injections of morphine sufficient to stop pain and continued vomiting. For corrosive acids the most convenient antidote is usually a solution of soap.

Treatment of Collapse: Rest, quiet; dry heat, especially to the region of the heart; atropine sulphate, \$\frac{1}{2}\text{op}\] grain hypodermically; strychnine sulphate \$\frac{1}{2}\text{op}\] grain hypodermically; strychnine sulphate \$\frac{1}{2}\text{op}\] grain hypodermically, repeated in three hours if needed (large doses of strychnine are not advisable, as it cannot stimulate the heart or raise the blood pressure as so long believed); camphor, hypodermic administration of from 0.5 to 1 cc. (8 to 15 minims) of a 10 to 20 per cent sterile solution in olive oil (or a ready prepared ampule), every half hour for several doses; caffeine, as strong coffee, by rectal injection if there is no distribute.

After-Treatment: Give a saline purge, if deemed necessary. For acute gastriis give morphine, sufficient to stop the pain, dextrose intravenously and rectal alimentation. Give cardiac stimulants, if needed. Later give bismuth subcarbonate in large doses (2 Gm., or 30 grains) twice a day; later, a milk diet. Treat duodenitis and nephritis, if they occur. Order absolute rest in bed for one or two weeks, if the irritation or corrosion was severe, lest perforation from ulceration be precipitated. If an ulcer of the stomach or a stricture occurs; it must be treated as usual.

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### CLASS II.—IRRITANTS OF THE CENTRAL NERVOUS SYSTEM

The principal symptoms of poisoning by drugs of this class are those of irritation of the central nervous system. There are restlessness and nervous excitement: there may be, later, delirium and convulsions and, perhaps, still later, coma. The pulse is full, bounding, and generally rapid; there may even be delirium cordis or tachycardia. Respirations are increased in rapidity, the face is flushed and the skin of the body feels hot and dry, and there often is increased temperature. There may be vomiting as there often is diarrhea; there is vesical irritability, and often strangury, depending on the drug. Some drugs of the atropine series may cause vesical paresis. There are muscular twitchings; there may be cramps; and, as stated above, convulsions may occur. The pupils are of course dilated if the poisoning is by any member of the atropine series or by cocaine, and they often become dilated during cerebral excitement from other members of this group

The symptoms of poisoning by irritants of the central nervous system are:

Immediate Symptoms: Gastro-intestinal burning and pain, perhaps nausea and vomiting, if the poison contains an aromatic or volatile oil; cerebral excitement, rapid heart, rapid respiration, erythemas and flushing of the face and surface of the body.

Frequent After-Symptoms: Purging, frequent urination, muscular twitchings, delirium, convulsions, coma and failure of the circulation.

Possible Remote Symptoms: Abortion in pregnant women; albuminuria and nephritis if the poison is a renal irritant as are many of the volatile oils; prolonged sleeplessness and nervous irritability.

# TREATMENT OF POISONING BY IRRITANTS OF THE CENTRAL NERVOUS SYSTEM

Administer warm water with the antidote, if there is such.

Give an emetic. The emetics in the order of their strength are: mustard (a tablespoonful in a glass of warm water); pecae (2 Gm. [30 grains] of powdered ipecae, or a tablespoonful of the syrup); zinc sulphate (2 Gm. [30 grains] dissolved in water); copper sulphate (0.50 Gm. [7½ grains] dissolved in water); apomorphine (½/6 grain given hypodermically). Any of these emetics may be repeated in fifteen minutes if there is no satisfactory result. It should be remembered that apomorphine is depressant to the circulation.

Wash out the stomach by means of a stomach tube, if there is no satisfactory emesis. If the vomiting is satisfactory, continue to administer warm water until the stomach washes clean

Administer one or more nerve sedatives. The best are bromides and chloral, and the dose depends on the character of the poison. They are best administered by the rectum, at least provided nausea and vomiting continue after the stomach has been cleared of the poison. If there is much circulatory depression, the best sedative to administer is morphine, hypodermically, perhaps combined with scopolamine (hyoscin). An adjunct to the action of the morphine as a central nervous sedative and as a strengthener of the circular nervous sedative and as a strengthener of the circular control of circular control of the circular control of circu

# Special Symptoms and Special Treatment of Various Poisons

		0 11 0	Special Treatment	Remarks
Name	Poison Class	Special Symptoms	Special Learning	
Acetanilid	Class III	Acetanilid Class III Cyanosis; lowered temperature	Oxygen inhalations; artificial res- Chronic poisoning causes anemia	Chronic poisoning causes anemia
Alcohol (ethyl)	Class III	Alcohol (ethyl) Class III		There may be acute delirium, it
Alcohol (methyl)	Class III	Alcohol (methyl) Class III Often late unless dose is large	Pilocarpine hydrochloride in one- eighth gr. dose is recommended;	ose is recommended; third or fourth day.
Ammonia	Class L	Ammonia Class I May he swelling and inflammation of the bronchial tubes, hence	Diluted vingari, lemon juice; Stomach tube contraindicated, followed hy olive oil; castor oil;	Stomach tube contraindicated.
Amyl nitrite Class III	Class III	dyspnea. Respiratory and cardiac failure	Artificial respiration; Trendelen-	Treatment of poisoning by other
Anilin	Class III	Diarrhea soon occurs; late symp-	Darrhes soon occurs; late symp. Tannic acid, one-half teaspoon: If much of the poison has been tone of class III. ful, in water; later magnestum shorbed, fatty degeneration o	See treatment for acetanilid.  If much of the polson has been absorbed, fatty degeneration o
Antipyrine Class III.	Class III	circulatory depression.	Sodium hicarhonate	the organs may develop. See acetanilid.
Arsenic Class I	Class L	Frontal beadache; constriction of the throat: colicky pains; erup-	Official antidote, ferri hydroxidum cum magnesii oxido, 3 oz.; later	Renal inflammation is a frequen sequence.
Atropin	Class II	tions on the skin. Flushed face; dilated pupils; dry throat; rapid heart.	tions on the skin.  Flushed face; dilated pupils; dry Tannic and; morphine in not too Catheterize the bladder.  Lings doses as a partial physic.	Catheterize the bladder.
Belladonna Bromides Camphor Camphor Cannabis indica.	Class III Class III Class III		Dry heat to the body.	See atropine. Treatment similar to chloral.

Cantharides	Class L	Kidney and bladder uritation,	uritation,	
Castor oil beans Carbolic acid	Chass III	Class III. Pupils dilated; coma		S.E
Cocaine	Class II	Cocaine Class II Pupils dilated; often rapid heart; Tannic acid if the drug has en-	Tannic acid if the drug has en- tered the stomach.	harg position.  If collapse, Trendelenhurg posi- tion; if respiratory failure, oxy-
Codeine Chromic acid Creosote	Class III.	Chas III Often cramp in the legs Chalk; line water; magnesia.	Chaik; Ilme water; magnesia.	gen and artificial respiration. See morphine. Correct name, chromium trioxide. See phenol.
Cyanide	Class I and III	Cyanide Class I and III May act like hydrocyanic acid; Methylene hine (methylthionine See hydrocyanic acid.	Methylene hlue (methylthionine chloride, U. S. P.)	See hydrocyanic acid.
Ergot	Class III	The cerebrum not much affected  Pupils dilated; cold surface of body: circulatory demander	Tannic acid; nitroglycerin bypo- dernically, Alcohol; nitroglycerin	Alcohol; nitroglycerin bypo-
Formaldehyde so- lution		Class I. If swallowed, very weak solutions If inhaled or taken in strong solu- of, ammonia; diluted arounsic rios, danger of edema of the	If swallowed, very weak solutions of ammonia; diluted aromatic	If inhaled or taken in strong solu- tion, danger of edema of the
Gelsemium Hydrochloric acid	Class III	Class III.  Class I. Lipe and mouth show white Lime water marrents	spirits of ammonia.	giottis. Emetica and stomach-tube should
Hydrocyanie acid	Class III	cechan.  Class III	Patient on back with feet raised; artificial respiration; ammonia	not be used. Avoid chalk and alkaline carbonates.
odoform	Class II and III.	Hyotoyamus Class II and III. May be symptoms of nervous conference and the properties of nervous prostration, with fever; later, prostration.	pin injections; wash stomach. See atropine.	See atropine.

Special Symptoms and Special Treatment of Various Poisons-(Continued)

	- Charles	The same of the sa		
Name	Poison Class	Special Symptoms	Special Treatment	Remarks
Lead acetate	Lead acetate Class L	Colic; muscle cramps; convulsions; stupor; coma.	Dilute bydrochlorie acid, a teaspoonful well diluted; magne- sum or sodium suiphate 30 Gm.	Later, multiple neuritis.
Matches (Co. Mercurie chloride (Co. aublimate)	Class III	Class II. Convulsions; coma; collapse Baw eggs and libumin water. See Class I. special article.	Raw eggs and albumin water. See special article.	See phosphorus. Late symptoms are salivation; nephritis; multiple neuritis.
Morphine Nicotine Nitrie acid.	STATE OF THE STATE	Morphine Const III Month and Ilps may be stained Nitre seid Const Month and Ilps may be stained		See optum. See tobacco. See remarks under hydrochlorie acid. See amyl nitrite.
Opium	Class III	Nitroglycerin Class III. Puglis contracted; respiration Tannie sid; stropine; wash stom- Opium Class III. Puglis contracted; respiration Tannie sid; stropine; wash stom- solution 1 part to 1,000.	respiration Tannie acid; atropine; wash stom- ach with potassium permanganate solution I part to 1,000.	
Oxalic acid	Class L	Oralic acid Class I Depressed circulation; cyanosis Magnesia; chalk; later, magnesium sulphate as cathartic.	Magnesia; chalk; later, magnesium sulphate as cathartic.	tinues to bear. Alkali and alkaline carbonates are contraindicated.
Paraldehyde Pbenacetin	Class III.	Paraldehyde Class III Covered temperature State Class III Covered temperature Class III Covered	Solium biearbonate See acetaniid. Lavage with 10% alcohol; then Avoid all oils and fats. warm water.	See acetanilid. Avoid all oils and fats.
Physostigma	Class III	Physostigma Class III ppils contracted; may cause vorsiting and purging.	cause	

Propositions Casa III			stonach as in class I. See phenol. May be delirium and convulsions. See atropine.	Sodium chlorida (aut solution)  Nitroglectrin Sodium hierarbonate, later, may Treatment quite similar to accompanie auglante.  Treatment quite similar to accompanie auglante.	Tambic and it holicos or nicetta (Sectional and Particularie (Sectional and Industry or nicetta (Trendelmuny position.  The best revaliored.  The section of	
Tannic acid. Atropine, % to 1 mg., is a physiologic antidote.  Use copper sulphate as emetic; wash strongch with 1-1,100 potassium permangante solution.	Tannic acid; atropine hypodermi- cally		Chas III May set like stropine, by may	Sedium chloride (alt solution).  Sedium chloride (alt solution).  Sensorial		
Breath smells garlickly. Most seri- ous symptoms sometimes slow in developing.	Pilocarpine Class III.		May act like atropine, but may	TI May cause pross of the eyelida suppression of the urine, and	Liya and mouth may show black beethar. Prostration	
Class II	Class III		Class III	COCOC SESSE HILL HILL HILL HILL HILL HILL HILL HIL	Class II	
Physostigmine (escrine) Phosphorus	Pilocarpine	Potas, chlorate Potas, bydrate Prussic acid. Ratsbane Resorcin Roughon-rats Salicylic acid.	Saloi Santonin Scopolamine	ate.	Sulphuric acid Class I.  Tobacco Class III.  Trional Class III.  Veratural Class III.  Veratural Class III.	

tion is ergot, given intramuscularly. If there are convulsions, inhalations of chloroform are required.

Apply dry heat to the body, if the surface is cool or

if there is a tendency to collapse.

If heart failure occurs later in the poisoning, from shock or from the depression caused by nausea, a circulatory stimulant should be given such as camphor (a saturated solution in olive oil, hypodermically); strophanthin (given hypodermically or intravenously in a dose of ½00 grain); epinephrine in aseptic ampule or I cc. (15 minims) of a 1: 10,000 solution; or intra-muscular injection of some aseptic ergot preparation (1 ampule). The dose is repeated in an hour if needed.

Give plenty of water with a demulcent, if there has been irritation of the stomach either from a volatile oil poisoning or from the emetic used.

### CLASS III.—DEPRESSANTS OF THE NERVOUS AND CIRCULATORY SYSTEMS

The symptoms of poisoning by drugs of this class are, as their name implies, those of circulatory and of nervous depression. The pulse is either slow or rapid, but generally weak; the surface of the body generally becomes cold; respirations are slowed; pupils are generally dilated unless the poison is morphine or nicotine; often the patient becomes faint; drowsiness soon develops, and if a narcotic has been taken stupor soon develops; perhaps convulsions will occur; later paralysis and coma.

Immediate Symptoms (if the poison is a depressant of the nervous system): Depression, drowsiness, slow, weak pulse; slowed respiration, paralysis, and coma. Later Symptoms: Muscular weakness and circulatory

Later Symptoms: Muscular weakness and circulatory weakness.

Immediate Symptoms (if the poison is a circulatory depressant): Rapid or slow, weak pulse; cardiac anxiety; cold, clammy perspiration; face pale; perhaps convulsions, and syncone.

### TREATMENT

Wash out the stomach (emetics or stomach tube, as directed).

Administer not only the chemical but a physiologic antidote, if there is such. Apply dry heat to the body.

If the poison was a narcotic, give cerebral and nervous stimulation. as caffeine (coffee), camphor, atropine, strychnine.

If the poison was a circulatory depressant, give atropine, ergot, epinephrine or strophanthin as described

Compel prolonged mental, circulatory and physical rest

The accompanying table is arranged alphabetically. The second column gives the class to which the poison belongs, and the treatment for this class has been given under the headings of the general treatment for each class. Therefore the number of the class to which the poison belongs refers to the treatment there outlined

Column 3 ("special symptoms") suggests symptoms of poisoning which are characteristic of the drug, such symptoms being in addition to those which are characteristic of the class of poisons to which the drug

belongs.

In the fourth column ("special treatment") is indicated any chemical or physiologic antidote that is valuable in treating poisoning by the drug, and is an addition to the general rules discussed above.

### USEFUL DRUGS

A book has been prepared by the Council on Pharmacy and Chemistry, entitled "Useful Drugs," It discusses a selected list of remedies, including only those drugs which usage has proved are efficient and reliable. The following are discussed in Useful Drugs:

Acacia,-Acacia, U. S. P. Mucilago Acacias .- Mucilage of Acacia, U. S. P.

Acotanilidum.—Acetanilid, U. S. P. Dosage: 0.20 Gm., or 3 graino.

Acetphenotidinum.—Acetphenetidin, U. S. P. Dosage: 0.30 Gm. or 5

grains. Acidum Acetyisalicylicum .- Acetylealicylic Acid, U. S. P. Aspirin. Dosage : 0.3 to 1 Gm., or 5 to 15 grains,

Acidum Boricum .- Boric Acid, U. S. P.

Acidum Boricum.—Boric Acid, U. S. P.
Glyceritum Boroglycerial.—Giyeerite of Boroglycerin, U. S. P.
Unguontum Acidi Beriel.—Ointment of Boric Acid, U. S. P.
Acidum Citricum.—Citric Acid, U. S. P. Dooage: 9.5 Gm., or 8 grains. Acidum Hydrochloricum.—Hydrochloric Acid, U. S. P.
Acidum Hydrochloricum Dilutum.—Diluted Hydrochloric Acid, U. S. P.

Dosage: 1 cc., or 15 minima.

Acidum Nitricum.-Nifric Acid, U. S. P. Acidum Salicvilcum,-Salicvilc Acid. H. S. P. Dosage: 0.75 Gm., or 12 graino Acidum Tannicum.-Tannic Acid. U. S. P. Dosage: 0.5 Gm., or 8 grains.

Acidum Acetyitannicum.—Acetyitannic Acid, U. S. P. Dosage: 0.6 Gm., or 10 grains. Glycoritum Acidi Tannici,-Glycerite of Tannic Acid, U. S. P. Dosage:

2.5 cc. or 40 minims. Adops Bonzolnatus.—Benzolnated Lard, U. S. P.

Adops Lange Hydrosus.-Hydrous Wool Fat. U. S. P. Adronalin.-See Epinephrina.

Aothor.-Ether, U. S. P. Dosage: 1 cc., or 15 minims, Spiritus Eothoris,-Spirit of Ether, N. F. Dosage; 4 cc. or 1 fluidrachm.

Acthylonum pro Narcosi.-Ethylene for anesthesia, N. N. R. Aothylis Aminobenzons .- Ethyl Aminobenzonte, U. S. P. Dosage: 0.3 Gm., or 5 grains.

Aothylis Chioridum .- Ethyl Chioride, U. S. P.

Acthylmorphinso Hydrochloridum. Ethylmorphine Hydrochloride, U. S. P. Dionin. Dosage: 0.015 Gm., or ¼ grain, Alcohol.-Alcohol. U. S. P.

Elixir Aromaticum .- Aromatic Elixir, U. S. P.

Alos.—Alos, U. S. P. Dosage: 0.125 to 0.3 Gm., or 2 to 5 grains, purgative; 0.03 to 0.06 Gm., or ½ to 1 grain, laxative. Aloinum .- Aloin, U. S. P. Dosage: 0.015 Gm., or 1/4 grain. Alumon,-Alum, U. S. P.

Alumon Exsiceatum.-Exsiceated Alum. U. S. P.

Alumini Acotas .- Aluminum Acetate. Liquor Alumini Subacotatis .- Solution of Aluminum Subacetate, N. F. Amidopyrina. -- Amidopyrine, U. S. P. Dosage: 0.3 Gm., or 5 grains.

Aqua Ammoniao.-Ammonia Water, U. S. P. Ammonii Carbonas .- Ammonium Carbonate, U. S. P. Dosage: 0.3 Gm.,

or 5 grains. Spiritus Ammoniae Arematicus.-Arematic Spirit of Ammonia, U. S. P. Dosage: 2 cc., or 30 minimo.

Ammonii Chloridum .- Ammonium Chloride, U. S. P. Dosage: 0,3 Gm., or 5 graine. Amylis Nitris .- Amyl Nitrite, U. S. P. Dosage; 0.2 cc., or 3 minims, by

inhalation. Amylum .- Starch, U. S. P.

Antimonii et Potassii Tartras -- Antimony and Potassium Tartrate, II. S. P. Dosage: 0.001 Gm., or 1/60 grain, expectorant; 0.03 Gm. or 1/2 grain, emetic.

Antipyrina,-Antipyrine, U. S. P. Dosage: 0.3 Gm., or 5 grains. ANTITOXINA SERA ET VACCINA -- ANTITOXINS SERUMS AND VACCINES

Antitexinum Dighthericum.-Dightheria Antitexin, U. S. P. Dosage: curative 10 000 units, amtective 1 000 units Antitoxinum Streptococcicum Scariatinum.—Scarlet Fever Streptococcus

Antitoxin, N. N. R. Dosage; curative 6,000 to 10,000 units, intramuscularly or intravenously; prophylactic, 1,000 to 3,000 units,

Antitoxinum Tetanicum.—Tetanus Antitoxin, U.S.P. Dosage: immunizing
dose on day of wound and repeated weekly until healed: 1,500 units dose on day of would and repeated weekly until meater: 1,000 units diluted with an gount volume of physiologic solution of sodium chloride, intraepinally, and 10,000 units intravenously at earliest possible moment; the intraspinal dose may be repeated daily until recovery is assured. and 10.000 units given subcutaneously on the fourth day. Toxinum Diphthericum ad Probationem Schickensem.—Diphtheria Toxin

for the Schick Test.—Diphtheria Immunity Test.—N. N. R. Dosage: 1/50 M. L. D. (0.1 cc.) or 1/40 M. L. D. (0.2 cc.) intradermally. Toxoldeum Dighthericum.-Diphtheria Toxold, N. N. R. Dosage; 1 cc.

subcutaneously, usually at the insertion of the deltoid muscle, repeated in 30 days.

Toxoldeum Diphthericum Purificatum.—Diphtheria Toxold Alum Pre-cipitated (Refined) N. N. R. Diphtheria Toxold (Havens), Dosage; 0.5 cc., or 1.0 cc. subcutaneously.

Serum Antimeningococcicum,-Antimeningococcus Serum, N. Dosage; used intraspinally, up to 20 or 30 cc. for a young child and 30 cc. for an adult

Toxinum Streptococcicum Scarlatinum.—Scarlet Fever Streptococcue Toxin, N. N. R. Dosage: 0.1 cc. for skin test dose—active immunization first of five doses 250 skin test doses,

Tuberculinum.—Tuberculin, N. N. R. Dosage: as a diagnostic agent. Vaccinum Antirabicum.—Antirabic Vaccine, N. N. R. Dosage: varies

according to method of preparation Vaccinum Staphylococcicum.-Staphylococcus Vaccine, N. N. B Vaccinum Typhosum.—Typhoid Vaccine, N. N. R. Dosage, 500,000,000 killed bacteria as initial dose and double the quantity at succeeding

doses one week or two weeks later. Vaccinum Variolae.-Smallpox Vaccine, U. S. P. Apemerahinae Hydrochieridum.-Apemerahine Hydrochleride, U. S. P.

Dosage: expectorant 8.881 Gm., or 1/68 grain; emetic 8.885 Gm., or 1/12 grain. Aqua .- Water, U. S. P. It is often preferable to use:

Aqua Destillata .- Distilled Water, U. S. P.

Argenti Nitras .- Silver Nitrate, U. S. P. Argenti Nitras Fusus,-Fused Silver Nitrate, U. S. P.

Argente-Proteinum Forte.-Strong Silver Protein, U. S. P. Dosage; 0.25 to 1 per cent solutions for instillations or injections; 1 in 1,000 or 1 in 2,000 for irrigations.

Argento Proteinum Mite .- Mild Silver Protein, U. S. P. Dosage; solutions of 10 to 50 per cent for applications several times daily. Aristol.-See Thymolic Iodidum.

Arseni Trioxidum .- Arsenic Trioxide, U. S. P. Dosage: varies from 0.001 to 0.002 Gm., or from 1/60 to 1/30 grain,

Liquor Acidi Arsenosi. Solution of Arsenous Acid. U. S. P. Dosage: 0.2 cc., or 3 minims. Liquor Potassii Arsenitis .- Solution of Potassium Arsenite, U. S. P.

Dosage: 0.2 cc., or 3 minims. Arsphenamina,-Arsphenamine, U. S. P. Dosage: 0.3 to 0.6 Gm., or 5 to 10 grains.

Negarsphenaming. -- Negarsphenamine, U. S. P. Dosage; 0,6 Gm., or 10 grains.

Sulpharsphenamina.—Sulpharsphenamine, N. N. R. Dosage: intramuscular or subcutaneous, 6.1 Cm. in 6.3 cc. of distilled water; intravenous, 6.1 Cm. in 2 or 3 cc. of distilled water.

Asafostida.—Asafetida, U. S. P. Dosage: 0.4 Cm., or 6 grains. Aspidium.—Aspidium, U. S. P.

Oleoresina Aspidii.—Oleoresin of Aspidium, U. S. P. Dosage: 4 Gm., or 1 drachm. Atropina.—Atropine, U. S. P. Atrosinas.—Atropine Sulphate, U. S. P. Dosage: 0.5 mg., or

1/120 grain.

Balsamum Peruvianum.—Balsam of Peru, U. S. P.
Barbitalum.—Barbital, U. S. P. Dosage: 0.2 to 0.5 Gm., or 3 to 8 grains.
Barbitalum Solublie.—Soluble Barbital, U. S. P. Dosage: 0.5 Gm., or

8 grains.

Baril Sulphas.—Barium Sulphate, U. S. P. For roentgenography.

Barii Sulphas.—Barium Sulphate, U. S. P. For roentgenography.

Belladonnae Folia.—Belladonna Leaves, U. S. P.

Tinctura Balladonnae.—Tincture of Belladonna. U. S. P. Dosage: 0.6

cc., or 10 minims.

Extractum Belladonnae.—Extract of Belladonna, U. S. P. Dosagc:

6.015 Gm., or ¼ grain.

Unguestum Belladonnae.—Belladonna Piaster, U. S. P. Unguestum Belladonnae.—Belladonna Ointment, U. S. P.

Benzolnum.—Benzoln, U. S. P.
Tinctura Benzoln, U. S. P.
Tinctura Benzoln, U. S. P.
Desage: 0.25 Gm., or 4 grains.
Bismuthi Subcarbonas.—Bismuth Subcarbonate, U. S. P.
Dosage: 1 Gm.,

or 15 grains.

Bismuthi Subgailas.—Bismuth Subgailate, U. S. P. Dosage: 1 Gm., or 15 grains.

Bismuthi Subnitras.—Bismuth Subnitrate, U. S. P. Dosage: 1 Gm., or 15 grains. Bismuthi Subsalleylas.—Bismuth Subsalleylate, U. S. P. Dosage: 1 Gm.,

Caffeina.—Caffeine, U. S. P. Dozage: 0.15 Gm., or 2½ grains.

Caffeina.—Caffeine, U. S. P. Dozage: 0.15 Gm., or 2½ grains.

Caffeina Sodio-Benzeas.—Caffeine Sodio-Benzeate, U. S. P. Dozage: 0.3 Gm., or 5 grains by mouth or 9.5 Gm. (7½ grains) hypodermically,

Gm., or 5 grains by mouth or 0.5 Gm. (7½ grains) hypodermically.
 Calcil Carbonas Praceipitatus. Precepitated Calcium Carbonate, U. S. P. Dosage: 1 Gm., or 15 grains.

Calcil Chieridum.—Calcium Chieride, U. S. P. Dosage: 1 Gm., or 15 grains. Calcil Lactas.—Calcium Lactate, U. S. P. Dosage: 1 Gm., or 15 grains.

Calx.—Lime, U. S. P.
Liquer Calcii Hydroxide.—Solution of Calcium Hydroxide, U. S. P.
Dosage: 15 cc., or 4 fluidrachms.

Caix Chlorinata.—Chlorinated Lime, U. S. P. Liquor Sodae Chlorinatae.—Solution of Chlorinated Soda, U. S. P. Liquor Sodae Chlorinatae Chlorinated Sodae, U. S. P.

nated Soda, U. S. P., or Modified Dakin's Solution. Employed as gargle or wash diluted with from 15 to 20 parts of water.

Camphora.—Camphor, U. S. P. Dosage: 0.2 Gm., or about 3 grains.

Aqua Camphora.—Camphor Water, U. S. P. Dosage: 10 cc., or 2½ fuldrachms.

fluidrachms.

Spiritus Camphorae.—Spirit of Camphor, U. S. P. Dosage: 1 cc., or
15 minims.

Linimentum Camphorae.—Camphor Liniment. U. S. P.

Cantharis.—Cantharides, U. S. P.
Ceratum Cantharidis.—Cantharides Cerate, U. S. P.

Ceratum Cantinarios.—Cantinarios Cerate, U. S. P. Capsicum.—Capsicum, U. S. P. Dosage: 0.66 Gm., or 1 grain,
Tinctura Capsici.—Tincture of Capsicum, U. S. P. Dosage: 0.5 cc., or
8 minims.

Carbo Ligni.—Wood Charcoai, U. S. P. Dosage: 1 Gm., or 15 grains.
Carbonei Tetrachloridum.—Carbon Tetrachloride, U. S. P. Dosage: 2.5
cc., or 40 minims; for children, 0.13 cc. or 2 minims for each year
of age up to 15 years.
Cardamonii Semen.—Cardamom Seed. U. S. P.

Tinetura Cardamomi.—Tincture of Cardamom, U. S. P. Dosage: 2 cc., or 30 minims. Caryophyllus.-Clove, U. S. P. Oleum Carvophylli.-Oli of Clove, H. S. P. Dosage: 8.1 cc. or 1% minims.

Cascara Sagrada.—Cascara Sagrada, U. S. P.
Extractum Cascarae Sagradae.—Extract of Cascara Sagrada, U. S. P. Dosage: 0.3 Gm., or 5 grains.

Fluidextractum Cascarae Sagradae.—Fluidextract of Cascara Sagrada, U. S. P. Dosage: 1 cc., or 15 minims.

Fluidextractum Cascarae Sagradae Aromaticum.-Aromatic Fluidextract of Cascara Sagrada, U. S. P. Dosage: 2 cc., or 30 minims. Chenopodium.-Used only in form of the oil:

Oleum Chenopodii.-Oil of Chenopodium, U. S. P. Dosage: 1 cc., or 15 mlpime Chioralis Hydras .- Chloral Hydrate, U. S. P. Dosage; 0.5 Gm., or 8

Chloramina.-Chloramine, U. S. P. Dosage: in aqueous solution of 0.1 to 4 per cent.

Chloroformum .- Chloroform, U. S. P. Dosage: 0.3 cc., or 5 minims, Aqua Chloroformi.-Chloroform Water, U. S. P. Dosage; 15 cc., or 4 fluidrachms

Spiritus Chloroformi.—Spirit of Chloroform, U. S. P. Dosage; 2 cc., or 30 minims Linimentum Chiereformi.-Chiereform Liniment, U. S. P.

Chromii Trioxidum.-Chromium Trioxide, U. S. P. Chrysarobinum.-Chrysarobin, U. S. P.

Unguentum Chrysarobini.—Chrysarobin Ointment, U. S. P.

Cinchona. —Cinchona, U. S. P.
Tincture Cinchona, Tincture of Cinchona, U. S. P. Dosage: 4 cc., or

I fluidrachm. Cinchophenum.-Cinchophen, U. S. P. Dosage: 0.5 Gm., or 8 grains, four

times a day to 1 Gm., or 15 grains, three times a day. Neocinchophenum.-Neocinchophen, N. N. R. Dosage; 0,5 Gm., or 8 grains. Cinnamomum.-Clnnamon, U. S. P.

Oleum Cinnamemi.-Oll of Cinnamen, U. S. P. Dosage: 0.1 cc., or ·146 minims.

Aqua Cinnamomi.—Cinnamon Water, U. S. P. Dosage: 15 cc., or 4 fluidrachms. Cocaina .- Cocaine, H. S. P. Cocainae Hydrochloridum.-Cocaine Hydrochloride, U. S. P. Dosage:

0.015 Gm., or 1/4 grain. Codeina .- Codeine, U. S. P. Dosage: 0.63 Gm., or 1/2 grain.

Codeinae Phosphas .- Codeine Phosphate, U. S. P. Dosage: 0.03 Gm., or 16 grain. Codeinae Sulphas .- Codeine Sulphate, U. S. P. Dosage: 0.03 Gm., or

14 grain. Colchiel Semen .- Colchicum Seed, H. S. P. Tinctura Colchici .- Tincture of Colchicum, U. S. P. Dosage; 2 cc., or 30 minims.

Collodium.—Collodion, U. S. P. Collodium Flexile .- Flexible Collodion, U. S. P.

Colocynthis.-Colocynth, U. S. P. Extractum Colocynthidis.-Extract of Colocynth, U. S. P. Dosage:

0.03 Gm., or 1/2 grain. Cresol.-Cresol, U. S. P. Dosage: 0.85 cc., or I minim. Liquor Cresolls Compositus .- Compound Solution of Cresol, U. S. P.

Dosage: Aqueous solutions containing 1 to 5 per cent. Cupri Sulphas .- Cupric Sulphate, U. S. P. Dosage: 8.81 Gm., or 1/6 grain, astringent; 0.25 Gm., or 4 grains (not repeated), emetic.

Oextrosum .- Dextrose, U. S. P. Dosage: 188 Gm., or 6 ounces, daily, used variously.

Dichloramina.-Dichloramine, U. S. P. Digitalis.-Digitalis, U. S. P. Dosage: from 0,2 to 0.25 Gm., or 3 to 4 grains Infusum Oigitalis .- Infusion of Digitalis, U. S. P. Dosage: 6 cc., or

146 fluidrachms Tinctura Oigitalis .- Tincture of Digitalis, U. S. P. Dosage: 1 cc., or 15 minims.

Elaterinum .- Elaterin, U. S. P. Dosage; 0.003 Gm., or 1/20 grain.

Emetinae Hydrochieridum.—Emetine Hydrochloride, U. S. P. Dosage: 0.02 Gm., or % grain in ameble dysentery; 1/12 to 1/6 grain as an expectorant. Ephedrina.—Ephedrine, N. N. R. Dosage: Ephedrine base, one per cent

in oil; 20 to 50 mg. (16 to % grain) every 3 to 4 hours for adults. Ephedrinae Hydrochleridum.-Ephedrine Hydrochloride, N. N. R. Enhadrinas Suiphas.-Ephedrine Sulphate, N. N. R.

Epinaphrina.—Epinephrine, U. S. P. Dosage: 0.5 mg, or 1/120 grain.
Liquor Epinephrinas Hydrochioridi.—Solution of Epinephrine Hydrochioride, U. S. P. Dosage: 0.5 cc. or 7 minims

Erecta .- Ergot, U. S. P. Dosage; 2 Gm. or 30 grains Fluidextractum Erectae. Fluidextract of Erect. U. S. P. Dosage: 2 cc... or 30 mlnims.

Eucalyptus.—Eucalyptus, U. S. P.
Eucalyptol.—Eucalyptol, U. S. P. Dosage: 0.33 cc., or 5 minims.

Oleum Eucalyptis. -Oil of Eucalyptus, U. S. P. Dosage; 0,5 cc., or 8 minims

Extractum Hapatici .- Liver Extract, N. N. R. Dosage: Extract from 300 to 800 grams of liver.

Fei Bovis.-Oxgall, U. S. P.
Extractum Feilis Bovis.-Extract of Oxgall, U. S. P. Dosage: 0.4 Gm., or 6 grains.

Ferri Carbonas.-Ferrous Carbonate Massa Ferri Carbonatis.- Mass of Ferrous Carbonate, U. S. P. Dosage : 0.25 Gm., or 4 grains.

Pliulae Ferri Carbonatis .- Pills of Ferrous Carbonate, H. S. P. Dosage: 2 pills. Ferri Chieridum .- Ferric Chieride, U. S. P.

Tinctura Ferri Chieridi.-Tincture of Ferric Chieride, H. S. P. Dosage: 0.6 ec., or 10 minims. Ferri et Ammenii Citras,-Iron and Ammonium Citrate, U. S. P. Dosage :

0.25 Gm., or 4 grains. Ferri ledidum .- Ferroue Iodide.

Syrupus Ferri iodidi .- Syrup of Ferrous Iodide, U. S. P. Dosage: 1 cc., or 15 minims. Farri Phosphas Solubilis.-Soluble Ferric Phosphate, U. S. P. Dosage : 0.25 Gm., or 4 grains.

Ferri Suiphas .- Ferrous Sulphate, U .S. P. Dosage: 0.1 Gm., or 11/2 grains

Farri Sulphas Exsiceatus,-Exsiceated Ferrous Sulphate, U. S. P. Dosage: 0.1 Gm., or 146 grains. Ferrum.-Iron, U. S. P.

Ferrum Reductum .- Reduced Iron, U. S. P. Dosage: 0.06 Gm., or I grain. Formaldehydum .- Formaldehyde.

Liquor Formaldehydi. Solution of Formaldehyde, H. S. P.

Gambir.-Gambir, U. S. P. Dosage: 1 Gm., or 15 grains Gentiana .- Gentlan, U. S. P.

Tinctura Gentianae Composita .- Compound Tincture of Gentian, U. S. P. Dosage: 4 cc., or 1 fluldrachm. Giusidum .- Gluside, U. S .P. Dosage: 1/4 grain equivalent to one lump of sugar.

Giveerinum.-Glycerin, U. S. P. Suppositoria Glycerini.—Suppositories of Glycerin, U. S. P.

Glycerylis Nitras .- Glyceryl Trinitrate. Spiritus Giycerylls Nitratis.-Spirit of Glyceryl Trinitrate, U. S. P. Dosage: 0.06 cc., or I minim.

Glycyrrhiza .- Glycyrrhiza, U. S. P. Fluidextractum Glycyrrhizae. Fluidextract of Glycyrrhiza II S P

Homatropinae Hydrobromidum.-Homatropine Hydrobromide, U. S. P. Dosage: 0.5 mg., or 1/120 grain. Hydrargyri Chloridum Corresivum .- Corresive Mercuric Chloride, U. S. P.

Dosage: 0.004 Gm., or 1/16 grain. Hydrargyri Chloridum Mits .- Mild Mercurous Chloride, U. S. P. Dosage: 0.005 to 0.02 Gm., or 1/12 to 1/2 grain,

Hydrarayri lodium Flavum.-Yeilow Mercurous Iodide, U. S. P. Dosage: 0.01 Gm., or 1/2 grain.

Hydrargyrl ledidum Rubrum.-Red Mercuric Iodide, U. S. P. Dosage: 0.004 Gm., or 1/16 grain.

Hydrargyri Oxidum Flavum.—Yellow Mercuric Oxide, U. S. P. Dosage: 0.1 to 1 per cent ointment Unquentum Hydrargyri Oxidi Flavi .- Ointment of Yellow Mercuric

Oxide. U. S. P. Ointment of 1% rellow mercuric oxide. Hydrargyri Salicylas.—Mercuric Salicylate, U. S. P. Dosage: 0,6 cc., or

10 minims of a 10 per cent suspension in vegetable fats intramuscularly. Hydraroyrum.-Mercury, U. S. P.

Hydraravrum cum Creta.-Mcreury with Chalk, U. S. P. Dosage: 0.25 Gm., or 4 grains. Massa Hydrargyri.-Mass of Mercury, U. S. P. Dosage: 0.3 Gm., or

5 grains. Unguentum Hydrargyri Fortius.—Strong Mercurial Gintment, U. S. P.

Unquentum Hydrargyri Mite .- Mild Mercurial Ointment, U. S. P. Dosage ; 4 Gm., or 60 grains as inunction to chosen area.

Hydrargyrum Ammoniatum.—Ammoniated Mercury, U. S. P. Unguentum Hydrargyri Ammoniati.—Olntment of Ammoniated Mercury, II. S. P

Hydrogenii Diexidum.-Hydrogen Diexide. Varogenii Diexicum.—Hydrogen Diexide. Liquor Hydrogenii Diexidi.—Sciution of Hydrogen Diexide, U. S. P.

Dosage: 4 cc., or 1 fluidrachm, applied diluted with from one to four volumes of water. Hyoscyamus.-Hyoscyamus, U. S. P.

Tinctura Hyoscyami.—Tincture of Hyoscyamus, U. S. P. Dosage: 2 cc., or 80 minims

insulin.-Insulin, N. N. R. lodoformum.-Iodoform, U. S. P.

lodum .- Iodine, U. S. P.

Liquor Iodi Compositus .- Compound Sciution of Iodine, U. S. P. Dosage : 0.1 cc., or 11/2 minime, diluted, after meals, Tinctura ledi.—Tincture of Iodine, U. S. P. Dosage: 0.1 cc., or 11/2

minims, diluted, after meals, ipecacuanha.-Ipecac, U. S. P. Dosage: 0.06 Gm., or 1 grain, expectorant;

1 Gm, or 15 grains, emetic.

Fluidextractum ipscacuanhae.—Fluidextract of Ipscac, U. S. P. Dosage: 1 cc., or 15 minims, emetic; 0.06 cc., or 1 minim, expectorant.

Syrupus ipecacuanhae.—Syrup of Ipecac, U. S. P. Dosage: 0.75 cc., or 12 minims, expectorant; 15 cc., or 4 fluidrachms, emetic,

Jaiapa.—Jaiap, U. S. P. Dosage: 1 Gm., or 15 graine.
Pulvie Jaiapae Compositue.—Compound Powder of Jaiap, U. S. P.

Dosage: 2 Gm., or 30 grains.

Lactosum.-Lactose, U. S. P.

Magneell Carbonas.-Magnesium Carbonate, U. S. P. Dosage: Antacid, 0.6 Gm., or 10 grains; iaxative, 8 Gm., or 2 drachms. Magneeli Citrae,-Magneslum Citrate,

Liquor Magnesii Citratie.—Solution of Magnesium Citrate, U. S. P. Dosage: 350 cc., or 12 fluidounces.

Magnesii Oxidum.—Magnesium Oxide, U. S. P. Dosage: antacid, 0.25 Gm., or 4 grains; iaxative, 3 Gm., or 45 grains. Magnesii Oxidum Ponderoeum.—Heavy Magnesium Oxide, U. S. P.

Dosage: came as Magneell Oxidum Magneell Sulphas .- Magneslum Sulphate, U. S. P. Dosage: 15 Gm., or 4 drachms.

Mentha Piperita .- Peppermint, U. S. P. Oleum Menthae Piperitae,-Oil of Peppermint, U. S. P. Dosage: 0.1 cc., or 11/2 minims.

Spiritus Menthae Piperitae.—Spirit of Peppermint, U. S. P. Dosage : 1 cc., or 15 minims. Aqua Menthae Piperitae .- Peppermint Water, U. S. P. Dosage: 15 cc., or 4 fluidrachms.

Menthol .- Menthol, U. S. P. Dosage: 0.06 Gm., or 1 grain.

Merbaphenum .- Merbaphen, N. N. R. Dosage; 1 to 2 cc. (15 to 30 minime) of the 10 per cent solution intravenously or intramuscularly, Mersalvium.-Mersalvi, N. N. R. (Salyrgan). Dosage: as a diuretic, an initial dose, intramuscularly or intravenously, 0.5 cc. (7 minims) of a 16 per cent solution to test tolerance: increased to 1 cc. or to a maximum of 2 cc. if required, at intervals of from 3 to 5 days. Methenamina .- Methenamine, U. S. P. Dosage: 0.3 Gm., or 5 grains.

Methylis Salicylas .- Methyl Salicylate, U. S. P. Dosage: 0.75 ec., or 12 minime.

Morphinas Hydrochieridum .- Morphine Hydrochieride, U. S. P. Dosage : 0.008 Gm., or 16 grain. Morphinge Sulphas .- Morphine Sulphate, U. S. P. Dosage: 0.008 Gm.,

or 1/4 grain.

Myrrha .- Myrrh, U. S. P. Doeage: 0.5 Gm., or 8 grains. Tinctura Myrrhae .- Tincture of Myrrh, U. S. P. Dosage: 2 cc., or 30 minims diluted for use in mouth.

Nitrogenii Monoxidum.-Nitrogen Monoxide, U. S. P.

Novocain .- See Procaine Hydrochloridum. Nux Vemica .- Nux Vemica, U. S. P.

Extractum Nucle Vamicas.—Extract of Nux Vomica, U. S. P. Dosage:

0.015 Gm., or ¼ grain.
Tincture of Nux Vomica, U. S. P. Dosage: 1 cc., or 15 minims.

Oleum Chaulmoograe,-Chaulmoogra Oil, U. S. P. Dosage: 0.3 cc., or 5 minlms.

Aethylis Chaulmoogra.-Ethyl Chaulmoograte, U. S. P. Dosage: 1 cc., or 15 minime. Oleum Morrhuae .- Cod-Liver Oll, U. S. P. Dosage: 12 to 24 cc., or 3 to

6 fluidrachms. Oleum Ricini,-Castor Ott. U. S. P. Dosage: 15 cc., or 4 fluidrachms.

Oleum Santali .- Oll of Santal, U. S. P. Dosage: 0.5 cc., or 8 minims. Oleum Terebinthinae .- Oli of Turpentine, U. S. P. Dosage: 0.3 cc. (5

minims) of the rectified oil Oleum Theobromatis .- Oll of Theobroma, U. S. P. Cacso Butter.

Oleum Tiglii .- Croton Oii, U. S. P. Doeage: 0.06 cc., or 1 minim Oplum .- Oplum, U. S. P. Dosage: 0.06 Gm., or 1 grain.

Opii Pulveratum.-Powdered Oplum, U. S. P. Dosage: 0.065 Gm., or 1 grain.

Tinctura Opii .- Tincture of Oplum, Laudanum, U. S. P. Dosage: 0.6 cc., or 10 minims Tinctura Opii Campherata.—Camphorated Tincture of Oplum, Paragoric,

U. S. P. Dosage: 4 cc., or 1 fluidrachm. Pulvis ipecacuanhae et Opil .- Powder of Ipecac and Opium, U. S. P. Dosage: 0.3 Gm., or 5 grains.

Oxygenium .- Oxygen, U. S. P. Pancreatinum .- Pancreatin, U. S. P. Dosage: 0.5 Gm., or 8 grains.

Paraffinum,-Paraffin, U. S. P. Paraidehydum .- Paraidehyde, U. S. P. Dosage: 2 cc., or 30 minims. Pelletierinae Tannas.-Pelletierine Tannate, U. S. P. Dosage: 0.25 Gm.,

or 4 grains. Pepsinum .- Pepsin, U. S. P. Dosage: 0.5 Gm., or 8 grains. Petrolatum .-- Petrolatum, U. S. P.

Petrolatum Album .- White Petrolatum, U. S. P. Petrolatum Liquidum .- Liquid Petrolatum, U. S. P. Dosage: 15 cc., or

4 fluidrachms. Phenobarbitalum.-Phenobarbital, U. S. P. Doesge: 0.03 Gm., or 1/2 grain.

Phanol,-Phenol U. S. P. Phenol Liquefactum.-Liquefied Phenol, U. S. P. Dosage: 0.06 cc., or Phenoiphthalein.-Phenoiphthalein, U. S. P. Dosage: 0.06 Gm., or 1 grain.

Phenylis Salicylas .- Phenyl Salicylate, U. S. P. Dosage: 0.3 Gm., or 5 grains. Phosphorus.-Phosphorus, U. S. P. Dosage: 0.6 mg., or 1/100 grain. Physosticminae Salicvias.-Physostigmine Salicylate, U. S. P. Dosage:

0.002 Gm., or 1/30 grain. Pilocarpinae Hydrochloridum.-Pilocarpine Hydrochloride, U. S. P. Dosage : 0.001 to 0.005 Gm., or 1/60 to 1/12 grain.

Pilocarpinae Nitras.-Pilocarpine Nitrate, U. S. P. Dosage: 0.005 Gm., or 1/12 grain Pituitarium .- Pitultary, U. S. P.

Liquor Pituitarii.—Solution of Pituitary, U. S. P. Dosage: 1 cc., or 15 minims Pix Pini.-Pine Tar, U. S. P. Dosage: 0.5 Gm., or 8 grains,

Unquentum Picis Pini.—Tar Olntment, U. S. P.

Plumbi Acetas.-Lead Acetate, U. S. P. Dosage; 0.06 Gm., or 1 grain. Liquor Piumbi Subacetatis. Solution of Lend Subacetate, U. S. P. Podophyllum.-Podophyllum, U. S. P.

Resina Podophylii.—Resin of Podophyllum, U. S. P. Dosage: 0.01 Gm., or 16 grain. Potassii Acetas.-Potassium Acetate, U. S. P. Dosage: 1 Gm., or 15

Potassii Bicarbonas.-Potassium Bicarbonate, U. S. P. Dosage: 1 Gm.,

or 15 grains. Potassii Bitartras.-Potassium Bitartrate, U. S. P. Dosage: 2 Gm., or

30 grains, Potassii Bromidum .- Potassium Bromide, U. S. P. Dosage: 1 Gm., or 15 grains

Potassii Carbonas.-Potassium Carbonate, U. S. P.

Potassii Chioras.—Potassium Chiorate, U. S. P. Dosage: Saturated solution may be used as mouth wash or gargle, Potassii Citras .- Potassium Citrate, U. S. P. Dosage: 1 Gm., or 15 grains.

Potassii Citras Effervescens.—Effervescent Potassium Citrate, U. S. P. Dosage: 4 Gm., or 1 drachm.

Potassii et Sodii Tartras.--Potassium and Sodium Tartrate, U. S. P. Dosage: 10 Gm., or 21/2 drachms. Pulvis Effervescens Compositus.—Scidlitz Powder, U. S. P. Dosage;

One set of two papers. Potassii Hydroxidum.-Potasslum Hydroxide, U. S. P.

Liquor Potassii Hydroxidi.—Solution of Potassium Hydroxide, U. S. P. Potassii iodidum.-Potassium Iodide, U. S. P. Dosage: 0.3 to 2 Gm., or 5 to 30 grains.

Potassii Permanganas.-Potassium Permanganate, U. S. P. Dosage; 0.06 Gm., or 1 grain. Precaine Hydrochieridum.-Precaine Hydrochloride, U. S. P. For local

Prunus Virginiana .- Wild Cherry, U. S. P.

Syrupus Pruni Virginianae.-Syrup of Wild Cherry, U. S. P. Dosage: 10 cc., or 2% fluidrachms.

Quinidinae Sulphas.-Quinidine Sulphate, U. S. P. Dosage; 0.03 Gm., or 5 grains four times a day. Quinina .- Quinine, U. S. P. Dosage: 0.1 to 1 Gm., or 11/2 to 15 grains. Quininae Bisuiphas.-Quinine Bisulphate, U. S. P. Dosage: 0.1 to 1 Gm.,

or 11/2 to 15 grains. Quininae et Ureae Hydrochloridum.—Quinine and Urea Hydrochloride. U. S. P. Dosage: varies as to use.

Quininge Hydrochloridum.-Quinine Hydrochloride, U. S. P. Dosage: 0.1 to 1 Gm., or 11/2 to 15 grains. Quininae Suinhas .- Quinine Sulphate, U. S. P. Dosage: 0.1 to 1 Gm., or

11/4 to 15 grains. Quininae Tannas.-Quinine Tannate, U. S. P. Dosage: 0.2 Gm., or 3 grains.

Resorcinol .- Resorcinol, U. S. P. Dosage: 0.125 Gm., or 2 grains, Rheum .- Rhubarb, U. S. P. Dosage: 1 Gm., or 15 grains.

Extractum Rhei.-Extract of Rhubarb, U. S. P. Dosage: 0.5 Cm., or 8 grains Syrupus Rhei Aromaticus.—Aromatic Syrup of Rhubarb, U. S. P.

Dosage: 10 cc. or 21/2 fluidrachms, Tincture Rhei Arematica.-Arematic Tincture of Rhubarb, U. S. P. Dosage: 4 cc., or 1 fluidrachm. Rosa,-Rose.

Aqua Rosae.-Rose Water, U. S. P. Dosage: for flavoring.

Salvarsan.-See Arsphenamina. Santoninum.-Santonin, U. S. P. Dosage: 0.06 Gm., or 1 grain. Sano,-Soan, U. S. P.

Linimentum Saponis.—Soap Liniment, U. S. P.

Sape Mellis.-Soft Soap, U. S. P.

Scanolamine Hydrohromidum.—Scanolamine Hydrohromide, U. S. P. Dosage: 0,5 mg., or 1/120 grain. Senna -Senna H. S. P. Dosage: 2 Gm., or 36 grains.

Fluidextractum Sennae,-Fluidextract of Senna, U. S. P. Dosage: 2 cc., or 30 minims Polyla Giveyrrhizae Compositus.—Compound Powder of Giveyrrhiza,

H. S. P. Dosage: 4 Gm., or 1 drachm. Syrupus Sennae .- Syrup of Senna, U. S. P. Dosage: 2 cc., or 30 minims.

Sinapis Nigra.—Black Mustard, U. S. P. Dosage: 10 Gm., or 2½ drachms in 250 to 500 cc. (½ to 1 pint) of water as emetic. Emplastrum Sinapis,-Mustard Plaster, U. S. P.

Oleum Sinapis Velatile.—Vointile Oil of Mustard, U. S. P. Dosage: 0.008 cc., or % minim.

Sodil Benzoas,-Sodium Benzoate, U. S. P. Dosage: 1 Gm., or 15 grains. Sedii Bicarbonas.-Sodium Bicarbonate, U. S. P. Dosage; 1 Cm., or 15 grains.

Sodii Binhosphas,-Sodium Bi-Phosphate, U. S. P. Dosage; 0.6 Gm., or 10 grains. Sodii Boras. Sodium Borate, U. S. P. Dosage; 6.75 Gm., or 12 grains.

Sedii Bremidum .- Sedium Bromide, U. S. P. Dosage: 1 Gm., or 15 grains. Sodil Cacodylas.-Sodium Cacodylate, U. S. P. Dosage: 0.06 Gm., or 1 grain Sedii Carbonas Monohydratus.-Monohydrated Sodium Carbonate, U. S. P.

Dosage: 0.25 Gm., or 4 grains. Sodii Chieridum .- Sodium Chieride, U. S. P. Dosage: 15 Gm., or 4 drachms as emetic; 4 Gm., or 60 grains as laxative.

Sodil Hydroxidum.-Sodium Hydroxide, U. S. P. Liquer Sedil Hydrexidi.-Solution of Sodium Hydrexide, U. S. P.

Dosage: 1 cc., or 15 minims. Sodil lodidum.-Sodium Iodide, U. S. P. Dosage: 6.3 Gm., or 5 grains. Sadii Nitris.-Sadium Nitrite, U. S. P. Dosage: 0.06 Gm., or 1 grain. Sedil Phosphas .- Sodium Phosphate, U. S. P. Dosage: 4 Gm., or 1 drachm.

Sodii Phosphas Effervescens.-Effervescent Sodium Phosphate, U. S. P. Dosage: 15 Gm., or 4 drachms. Sodii Salicylas.-Sodium Salicylate, U. S. P. Dosage: 1 Gm. or 15 grains.

Sedii Sulphas,-Sodium Sulphate, U. S. P. Dosage: 15 Gm., or 4 drachms. Sodil Thiosulphas .- Sodium Thiosulphate, U. S. P. Dosage: 1 Gm., or 15 Stanbylococcus Vaccina. See Antitoxina. Sera et Vaccina.

Strophanthinum.-Strophanthin, U. S. P. Dosage; 0.5 mg., or 1/120 grain.

Strychninge Sulphas .- Strychnine Sulphate, U. S. P. Dosage: 0.002 Gm., or 1/30 grain. Sucrosum.-Sucrose, U. S. P.

Sulphonal.-See under Sulphonmethanum.

Sulphonethylmethanum.-Sulphonethylmethane, U. S. P.-Trional, Dosage : 0.75 Gm., or 12 grains, Sulphonmethanum.-Sulphonmethane, U. S. P.-Sulphonal, Dosage: 0.75

Gm., or 12 grains. Sulphur .- The three official forms are: Sulphur Lotum .- Washed Sulphur, U. S. P. Dosage: 4 Gm., or 60

grains. Sulphur Praecipitatum .- Precipitated Sulphur, U. S. P. Dosage: 4 Gm., or 60 grains. Sulphur Sublimatum .- Sublimated Sulphur, U. S. P. Dosage: 4 Gm., or

60 grains. Unquentum Sulphuris .- Sulphur Ointment, U. S. P.

Tannaibin.—See under Acidum Tannicum Terpini Hydras .- Terpin Hydrate, U. S. P. Dosage: 0.25 Gm. or 4 grains.

- Theobromina,-Theobromine, N. N. R. Dosage: 0.35 to 0.5 Gm., or 5 to
- S graine.

  Theobrominae Sodie-Salleylas.—Theobromine Sodium Salleylate, U. S. P.

  —(Duretin). Dozage: 1 Gm., or 15 graine three times a day. Theophyllina.—Theophylline, U. S. P. Doesge: 0.2 to 0.35 Gm., or 3 to
- 5 graine three times daily. Thymol.-Thymol, U. S. P. Dosage: 0.125 Gm., or 2 grains as antiseptic and 2 Gm. or 30 grains divided into three doses as anthelmetic.
- Thymolis ledidum.—Thymol Iodide, U. S. P.
- Thyroideum.—Thyroid, U. S. P. Dosage: 0.06 Gm., or 1 grain. Tolu.—Tolu. U. S. P.
- Syrupus Talu Syrup of Tolu, H. S. P. Dosage: 10 cc. or 2% fluiddrachms Transcantha .- Transcanth, U. S. P.
- Trinitrophenol .- Trinitrophenol, U. S. P. Dosage : 0.03 Gm., or 1/2 grain. Trional.-See under Sulphonethylmethanum,
- Viesterel,-Viesterel, N. N. R. Viosterel in Oil, N. N. R.—Dosage: For infant, 8 to 10 drops daily; for premature and rapidly growing child. 15 drops; daily curative dosc, 15 to 20 drope; in severe cases and for adults. 20 drops or more daily.
- Zincl Acetas.—Zinc Acetate, U. S. P. Doeage: 0.125 Gm., or 2 graine. Zincl Chleridum.—Zinc Chloride, U. S. P. Liquer Zincl Chloride.—Solution of Zinc Chloride, U. S. P.
- Zinel Oxidum.—Zine Oxide, U. S. P.
  Unquentum Zinel Oxidi.—Ointment of Zine Oxide.
- Zinci Sulphas .- Zinc Sulphate, U. S. P. Dosage: 1 Gm., or 15 grains.
- Zinglber.—Ginger, U. S. P. Dosage: 0.5 Gm., or 8 grains.
  Tinctura Zingiberis.—Tincture of Ginger, U. S. P. Dosage: 2 cc. or
  - 30 minime.

### SOME THERAPEUTIC PRINCIPLES

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Than Medicine, 57—Pain as a Symptom, 58.

### INDIVIDUAL TENDENCIES

Teachers of therapeutics emphasize the necessity of individualizing the patient but sometimes forget the importance of family tendencies. There is no more doubt that a person inherits family weakness and family strength or, if the phrase is preferred, family tendencies, than there is that he inherits the features and general physique of his parents and grandparents. These tendencies are often recognizable by the general appearance and physical conditions; if not, they can almost always be discovered by a careful investigation of the family history of the patient.

### THE FAMILY HISTORY

It should be the rule of the physician to inquire carefully into the family history of every new patient. Heredity and environment are the two factors most prominent in the production of physical and mental health. Environment may modify hereditary conditions. Heredity or constitution is therefore the most important factor in raising and developing an ideal rac. The importance of good environment for the perpetuation of physical and mental health is generally recognized. But environment will not eliminate a hereditary tendency to disease or to mental or physical insufficiency. Neither will environment develop perfect mental and physical health when there is an inherited deficiency, although environment can improve deficiency caused by injury or acquired by disease.

### UNSCIENTIFIC PRESCRIBING

Lack of scientific therapeutic teaching causes some physicians to use secret proprietary preparations. In most instances, the active ingredient of the preparation is a drug which the physicaln has long used, but in a simpler and less expensive form. The general practitioner who writes of his therapeutic successes should constantly bear in mind, first, the trend of troublesome conditions to recovery; second, that it is not always the last drug, preparation or treatment that benefited the patient, but the previous treatment that may really have caused the cure; third, that many new drugs or new preparations offered with the enthusiasm of the physician cure patients by psychic effect, as do changes of physicians or environment. The influence of suggestion should not be overlooked.

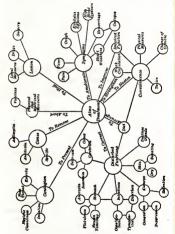
### THERAPEUTICS MORE THAN MEDICINE

The scope of therapeutics and its relation to the practice of medicine are well shown by the accompanying chart prepared by Dr. Osborne (Am. J. M. Sc., July 1916, p. 1).

A disease cannot be correctly treated unless the fol-

- Can the etiologic factor in a given disease be discovered, and can it be removed? This is the primary treatment.
- 2. What physiologic processes in this patient are disturbed by this disease? The aim of all treatment should be the attempt to correct such disturbed physiology, and at the same time not disturb the normal physiologic processes.
- 3. The pathologic conditions which are the result of the disease should be removed if possible, ameliorated if removal is not possible, and never irritated or made worse by any medicinal or physical treatment. Special care should be taken that whatever treatment is deemed advisable for the patient, it should not aggravate or make worse the pathologic condition present.
- 4. The symptoms and signs of the disease which in their totality determine the diagnosis, and the extent to which the disease has progressed, are in their totality of minor and secondary importance in the treatment. On the other hand, individual troublesome symptoms must be removed or ameliorated, else normal physio-

logic processes which are necessary to recovery cannot be performed, and toxemias that otherwise need not have occurred may perhaps be the determining cause of the nonrecovery of the patient.



### PAIN AS A SYMPTOM

Of all symptoms, pain is most important; it is one from which the patient must have relief. It does not make much difference whether such pain is pathologically excusable or present only on account of psycho-

logic mistake; the nervous irritability and depression caused by it should be taken into consideration and must be treated or, better, managed. Pain must be prevented if possible. This does not mean that the physician should hastily use unneeded narcotics, or that he should ever use a narcotic without regret and without the extra supervision that should always go with such treatment. The skilful, thoughtful, discriminating physician can determine the best method of eradicating the symptom of pain in each patient. Frequently in making examinations or in treating patients, great comfort may be secured merely by altering the posture. Pain after operation is often due to lack of support of the back. Incidentally the soothing effects of the warm bath or the warm pack should not be overlooked.

The American Medical Association publishes a book on "The Indispensable Uses of Narcotics." It indicates the cases in which narcotics are necessary and discusses also the various drugs and methods that are of use in relieving pain without being habit forming.

### INFECTIOUS DISEASES

Immunization Against Infectious Diseases, 60— Seariet Fever, 61—Measles, 77—Whooping Cough, 85—Diphtheria, 94—Septic Sore Throat, 111— Rubella (German Measles), 113—Chickenpox: Varicella, 114—Mumps, 116—Epidemic Meningitis, 119—Acute Anterior Poliomyellis, 126—Epidemic Lethargic Enceptalitis, 146—Typhoid, 150—Typhus Fever, 164—Acute Dysentery, 168—Amebic Dysentery, 172—Influenza: Grip, 180—Epidemic Hicup, 190—Pneumonia, 191—Absecss of the Lung and Empyema, 217—Rheumatic Fever, 223—Chronic Arthritis, 229—Arthritis Deformans, 239—Erysipelas, 242—Botulism, 247—Tetanus, 249—Malaria, 255—Tuberculosis, 261

# IMMUNIZATION AGAINST INFECTIOUS DISEASES

In the discussions of individual infectious diseases which follow there are frequent references to immunization by means of toxin, antitoxins, vaccines, convalescent serums, whole bloods and similar methods. The question is repeatedly raised as to whether or not people may be administered several of these immunizing agents simultaneously or closely following one another. The question is also asked as to the order to be followed in immunizing against several diseases. Not a great deal of evidence is available as to instances in which this has been done. It is not known, for instance, whether successful vaccination against smallpox would interfere in any way with the immune reactions against scarlet fever toxin, diphtheria toxoid or pertussis vac-Neither is it known whether the inoculations mentioned would cause more serious symptoms if made at one time than if made at different times; but it would seem reasonable to assume that simultaneous inoculations might give rise to serious disturbances. Perhaps the best plan would be to allow four months to intervene between successive immunization procedures. Because whooping cough causes more deaths in children under 2 years of age than do diphtheria, measles and scarlet fever combined, it is prudent to immunize first against whooping cough—preferably during the second half year of life. Four months later a single alum toxoid injection against diphtheria may be given. Four or more months thereafter, when the Schick test is done, preferably in the spring or autumn, the smallpox vaccination may be done.

### SCARLET FEVER

"Scarlatina," "scarlet rash" and "scarlet fever" are synonymous terms. Scarlet fever may be, and often is, a serious disease, with rather high temperature, severe sore throat, intense and widely spread eruption, followed by copious desquamation. However, the fever in many cases may be slight or even absent; the throat may not show more than slight congestion, the eruption, if not entirely absent, may not be pronounced in appearance, widely spread over the body, or of long duration, while the desquamation may be so slight as to be hardly recognizable.

Not only may the mild cases be followed by the most serious sequelae which often are observed after the severe forms of the disease, particularly inflammation of the kidneys, but also severe forms of scarlet fever may be, and often are, contracted from patients whose symptoms have been exceedingly mild.

A possible explanation of apparent immunity to scarlet fever may be, at least in some cases, that these immune individuals have in their carlier life passed through an attack of scarlet fever of so mild a type that a physician was not called to the patient, or if one was called, he did not recognize the nature of the disease. This, however, does not explain all cases of apparent immunity. Undoubtedly there are many persons who never contract the disease except after musual exposure. It is, however, unjustifiable carelessly or wittingly to expose a child or adult to the disease, no matter how mild the type may be

### CONTAGIOUSNESS

Scarlet fever is apparently due to hemolytic streptococci, which are invariably present in the disease, as demonstrated by George F, and Gladys Henry Dick in 1923. These organisms gain access to the body through the nose and throat. The disease is commonly spread by direct contact. Apparently less than half of the total number of persons exposed to scarlet fever develop the disease. The condition is contagious from the beginning of the symptoms and most communicable during the period of the eruption. Stevens and Dochez (J. A. M. A., Dec. 26, 1926, p. 2137) say that "the same strain of Streptococcus scarlatinae may cause clinical scarlet fever or scarlatina sine exanthemate."

The streptococci exist actively and abundantly in the secretions from the throat and nose, and also in the discharges from the ear and from the suppurating glands, when they are present. Probably when the disease is transmitted by dissemination of the scales, the latter have been contaminated by these secretions. Obviously, then, the problem which confronts both family and physician, as well as sanitarian, is to control the dissemination of these various secretions, discharges

and exfoliations.

### ISOLATION AND DISINFFCTION

The establishment of isolation often taxes severely the tact and good judgment of the physician. If the family is large and lives in a small house or apartment and on a limited income, and if the municipality possesses an isolation hospital, or if wards of a hospital are set apart for the treatment of contagious diseases, the easiest way is to transport the patient immediately to such an institution. Here he will be under the care of attendants who are accustomed to handle patients with the disease, and who are trained to exercise all the precautions necessary to prevent the spread of the infection. Most towns have no special provision for taking care of scarlet fever, and in such cases the patients must be treated in their own homes. If the family has ample means and lives in a large house, a large room or a suite of rooms must be set apart for the exclusive use of the patient and the special attendant, who must give him exclusive attention. Such an apartment or suite should, if possible, be located on the top floor of the house or at the end of a

hall, so that the other members of the family will have no occasion to go near it. The room should be large and sunny, and all unnecessary articles, such as curtains, upholstered furniture and ornaments, should be removed, so that there will be as few articles as possible to which the disease organisms may adhere and which will need to be cleaned or destroyed after the recovery of the patient. The attendant should not invade other parts of the house. Food and other necessities should be left outside the door of the apartment occupied by the patient by another member of the household. Similarly, everything which requires removal from the infected apartment should be disinfected and placed outside the apartment, and thence carried away. The most important things which are likely to require removal are dishes, clothing, and excreta. These should be disinfected by being placed in suitable vessels and then allowed to soak for an hour in a 2.5 per cent solution of phenol (carbolic acid). Things which are of little or no value and which are combustible, such as the remnants of food and pieces of cloth or paper which have been used about the room, should be burned. If the nurse finds it necessary to leave the patient's quarters, she should change all her outer garments outside of the patient's room; she should cover her hair, and avoid coming into close contact with any one. These precautions of isolation should be carried out continuously and strictly until desquamation is entirely completed.

During the period of desquamation the patient should be sponged or bathed once or twice a day with hot water (and if there are bathroom facilities the convalescent should have a daily hot tub bath), and then the skin should be anointed with adeps lanae hydrosus (hydrous wool fat) which has been softened with almond (or other bland) oil, and perfumed to suit. Phenol ointments are inadvisable, as any absorption would irritate the kidneys. Sponging with alcohol is contraindicated. After desquamation has ceased, the patient should remove all the clothing which he has been wearing, take a warm bath, with soap, and have his head well shampooed. Then he must dress in clean clothing.

### TERMINAL DISINFECTION

The apartment should be thoroughly disinfected but need not be fumigated. Fumigation after scarlet fever. diphtheria and measles does not seem to pay for the cost and trouble it causes. All washable clothing and hedclothing should be boiled; all other clothing should be baked and put into the sunlight. Carpets and rugs may be thoroughly sunned and aired or washed with antiseptics. Various washing solutions may be used. such as chlorinated lime solutions, 5 per cent formaldehyde solutions, mercuric chloride solutions 1:500 5 per cent phenol solutions, or better, the higher coaltar disinfectants, as liquor cresolis compositus. The New York Board of Health orders the woodwork and floors scrubbed with a hot solution of 1 pound of washing soda to 3 gallons of hot water. Bedding and night clothing must be soaked in phenol solutions and then boiled in soapsuds for half an hour. Books and toys should be burned. Outside air and sunlight are among the most useful of disinfectants.

### ISOLATION OF PATIENT

When it is possible to carry out such strict isolation as has been described, there is no necessity of quarantining the rest of the family but, unfortunately, such complete isolation though ideal can rarely be carried out in actual practice. Even when a large family occupies a few rooms, it is essential that one room be selected for the patient, and that he be kept in it constantly, and that all other members of the family be kept out of it, except that one selected as attendant, Under such conditions it is often impracticable for the attendant to remain constantly in the room with the patient. She must frequently leave the room, not only to get things which the patient requires, but also to perform services for the remainder of the family. Under these circumstances it is desirable and often practicable that such members of the family as attend school, or work in stores or shops, should leave home, and live elsewhere for six or eight weeks. Those who are obliged to remain at home should avoid as much as possible coming in contact with the attendant. The latter should have several aprons, with sleeves. These should be large enough to cover all her outer clothing. One of these she should wear constantly while in the patient's room. She should always wash her hands on leaving the room.

### PROPHYLACTIC MEASURES OF PHYSICIANS

Physicians who use even a moderate degree of caution rarely transport the disease from a patient to another person. When this does happen, the victim is usually a member of his own family. He should endeavor so to arrange his calls that he will not go directly from a patient ill with scarlet fever to a family in which there is a child. On entering the room of such a patient he should put on a long cotton, linen or rubber coat. He should avoid sitting on the bed, or allowing the beddothing to come in contact with his own clothing. On leaving the room he should thoroughly wash his hands, dry them on a clean towel and remove the gown just outside the patient's door.

### PROPHYLAXIS DURING CONVALENCE

During convalescence the patient should use only such books, magazines and messpapers as can be burned when he is through with them. Neither should he be allowed to send letters through the mail or by messenger.

No drug treatment is known that will prevent persons exposed to the disease from contracting it or developing it. Although belladonna has been extensively used for this purpose, there is no reason for believing that it has ever been effective.

Although often advocated, and sometimes used, the impregnation of the atmosphere of the room with antisepties (phenol) and aromatic oils seems to be of no value in killing the germs or in hastening recovery. Various cresol preparations and oil of eucalyptus have been especially recommended for this purpose, but their value is small, and the danger of too much absorption of phenol vapor causing kidney irritation is ever present.

Dogs and cats must be excluded from the rooms of all patients suffering with contagious diseases; this is especially true of scartet fever. The doors and windows must be screened from flies, if it is the season for them.

# PROPHYLAXIS BY USE OF DICK TOXINS

As long ago as 1906 Gabritchewsky, of Russia, showed that a streptococcus from scarlet fever produced a toxin which, when injected, would cause scarlatinal rashes. He and his colleagues vaccinated children with this substance and said that it protected them against the disease.

The Dicks, after several years of study, found "that hemolytic strentococci are practically constantly associated with scarlet fever," but that "no one organism is present constantly in the blood stream during the acute stage of this disease." They found that the scarlet fever streptococci produced a toxin which, absorbed into the blood, produces the rash. They also found that when suitable amounts of this sterile toxin are injected into susceptible persons it may cause a reaction similar to the disease of scarlet fever, namely, nausea, vomiting, fever and a scarlatinal eruption. "These symptoms appear within a few hours after the injection of the toxin, and disappear within forty-eight hours." This toxin "is neutralized by convalescent scarlet fever serum due to the presence of an antitoxin in the blood of recovered patients. If persons susceptible to scarlet fever are immunized by injections of small doses of toxin, their blood serum acquires similar antitoxic properties."

These experimenters developed what is termed the Dick test for scarlet fever. A standardized toxin is used as a skin test, and 0.1 cc. of this solution is injected intradermally on the flexor surface of the forearm at the junction of the upper and middle thirds. In from twenty-two to twenty-four hours, if the reaction is positive, an area of reddening, 1 cm. or more in diameter, appears. The Dicks consider less than 1 cm. of reddening as a negative test, and, also, a reaction that appears and has entirely disappeared in twentyfour hours is negative. The injection must be given with a syringe that has been sterilized by prolonged boiling. Antiseptics should never be used in these syringes, lest irritation be caused and false reaction develop. There is no foreign serum in scarlet fever toxin. Occasional individuals, particularly those who have had diphtheria toxoid, are sensitive to the proteins in the ordinary broth used in the preparation of the toxin. A small amount (O.2 cc. of a 1:1000 solution) of epinephrine chloride taken up in the same syringe and injected with the toxin prevents disagreeable reactions.

Kramer and Francissezi (Monatechr, f., Kinderh., September 1926, p. 421; Am. J. Die. Childa, January 1927, p. 151) note that during the course of a disease a patient may lose his susceptibility to this toxin. Further, they found great variability in the susceptibility to the test. The undernourished child shows the greatest fluctuations in these reactions. Stevens and Dochez (J. A. M. A., April 10, 1926, p. 1110) say that scarlatinal infection of the throat without a rash may occur in those who have a negative skin test reaction; i. e., the Dick test cannot show immunity to throat infections from Streptococcus scarlatinae. The Dicks say that less than 10 per cent of persons immunized with the five doses of scarlet fever toxin lose enough immunity to require further immunization.

Pseudoreactions occurring after immunization have been described by Zingher. In January 1924, the Dicks reported that they had found the reaction to be positive in 41.6 per cent of the persons tested who had not had scarlet fever, and the "tests to be negative or only slightly positive in all of the convalescent scarlet fever patients tested." They say that in any large series of individuals tested there will be a group of clearly negative reactions, another group of positive reactions. and a third group of slightly positive reactions. They would immunize all except those showing negative reactions. They give three to five doses of the toxin at weekly intervals. Later, they give a skin test to note the degree of immunity that has been caused. The skin reaction in these cases after immunization is frequently a redness that fades within twenty-four hours and is therefore negative. If the skin test is still positive. they repeat the third immunizing dose.

When there has been definite exposure to scarlet fever they immediately make a skin test, as well as a culture of the throat from the tonsils. If the skin test is negative, they proceed no farther. If the skin test is

positive and the culture from the throat does not show hemolytic streptococci, then they advise active immunization with three doses of toxin. If the throat culture shows hemolytic streptococci, passive immunization should be caused by injecting "convalescent scarlet fever serum, or concentrated scarlet fever antitoxin." This passive immunization will not last more than a few weeks.

According to Ludvig Hektoen (1, A, M, A., Jan. 6, 1934, p. 41), before the use of the Dick test and the preventive injections of scarlet fever toxin the percentage of scarlet fever among 516 nurses at the Durand Hospital was 7.7. Of 614 nurses taken into service since the Dick test came into use, 3, or 0.50 per cent, have had scarlet fever.

In 1933, 50 of 83 children immunized in 1925, were given the Dick test. Sixty-four per cent were found negative while 36 per cent were slightly positive.

## SERUM TREATMENT

In 1924, F. G. Blake (Boston M. & S. J., July 10, 1924, p. 43) reported his treatment of scarlet fever with the Dochez antiscarlatinal serum. He and his co-workers demonstrated that a specific toxin or toxic substance is present in the blood in scarlet fever, which substance promptly disappears from the blood after the serum injection. Blake also found the serum of benefit in septic complications occurring in scarlet fever.

Blake and Trask, in a later report (Boston M. & S. J., Oct. 8, 1925, p. 659), maintain that scarlatinal anti-toxin in proper amount is a specific and certain cure for uncomplicated scarlet fever. If combats the toxemia of the acute stage, even with septic complications, but it is not of value in postscarlatinal sepsis. To be valuable the antitoxin must be able to neutralize at least 10,000 skin test doses of toxin per cubic centimeter. The amount of antitoxin needed to cure scarlet fever promptly and with certainty by intramuscular injection varies from 3,000 units to 12,000 units (30 to 120 cc. of serum which neutralizes 10,000 skin test doses of toxin per cubic centimeter), depending on the size of the patient and the severity of the disease. The anti-toxin should be given as soon as the diagnoss is made.

DIET

# USE OF SCARLET FEVER STREPTOCOCCUS ANTITOXIN

The antitoxic serum is prepared by immunizing animals against the toxin of scarlet fever hemolytic streptococci. The curative dose of this serum is from 6,000 to 10,000 units given intramuscularly or intravenously. For immediate prophylaxis from 1,000 to 3,000 units are given.

# OTHER TREATMENTS

A. Isolation.—Strict isolation measures, already discussed under other headings, are most important in this disease, and the nurse should distinctly understand that it is the secretions of the mouth and nose, and perhaps suppurating complications, that carry infection. The greatest possible care to disinfect or sterilize articles contaminated by such secretions must be exercised, as the infecting germ is persistent and lives for a long time unless killed. The most efficient cleanliness of the patient, nurse and the physician who handles the case is essential. The length of isolation need not be determined by negative cultures of scarlatinal streptococci from the tonsils. It is imperative that the patient be isolated as long as there are any infective secretions, usually about four weeks in all.

B. Diet .- As in the beginning of all diseases, especially the infectious ones, the bowels should be thoroughly evacuated with castor oil, calomel, or whatever the physician deems best; subsequently, they should be moved daily by a gentle laxative, such as a cascara preparation, when necessary. If the patient has diarrhea, it is generally caused by a mistake in the diet. Milk is the best basis of the diet in scarlet fever. Intestinal indigestion is not frequent. Foods that add products to the blood that during excretion are likely to cause irritation of inflamed kidneys should be avoided. Give a diet rather low in proteins. Also, if possible, no drugs should be administered that tend to irritate the kidneys, especially after the first week of the illness. Such drugs are coal-tar products, synthetic products, caffeines, and any of the drugs that are known as stimulant diuretics. Even drugs that contain salicylic acid should, in general, be avoided.

The greater the intensity of the disease, the more liquid the diet should be. While milk is the basis, thin cereal gruels are advisable from the start. Malted milk may be added to this diet, and lemonade, orangeade or oranges, as deemed advisable. Later, toasted bread, crackers, and various kinds of cereals, and still later, baked potato, rice, corn starch and many other cereal and milk foods, as well as a greater variety of fruit, should constitute the diet.

As soon as the convalescence is established, and even before, if the disease is prolonged, a small dose of iron should be given daily, as the blood cannot get this nutriment on the above diet. A sugar of iron (saccharated oxide of iron) 3 grain tablet should be given from one to three times a day. The patient should always receive plenty of water. If any apparent irritation of the kidneys occurs, it may be well to withhold the fruits and to diminish the amount of food,

temporarily.

C. Fever.—If the temperature becomes very high it may be advisable to give several doses of an antipyretic, such as acetanilid, antipyrine, or acetphenetidin, always bearing in mind the irritant effect of these drugs on the kidneys. Warm sponging of the body will also tend to reduce the temperature and make the patient comfortable. It relieves itching, and many times is soothing. Cold sponging in scarlet fever is inadvisable. Restlessness and sleeplessness will also increase the fever, and often a few doses of sodium bromide will be of great benefit. It not only causes the patient to sleep, but reduces the irritability of the peripheral nerves. Also, anything that relieves itching or burning of the skin will reduce the irritability. Quinine is inadvisable, as it is excitant to the brain and may tend to congest the ears and add one more element that may cause middle ear complications. An ice cap to the head is usually inadvisable, although it may relieve the local congestion if meningitis is present

D. Care of the Nose and Throat.-Antiseptic, alkaline and cleansing gargles and sprays for the throat should be freely used. The cleaner the nose and throat in scarlet fever, the less the secondary infection, the less the toxemia, and the less the danger. Whatever method is used to clean the nostrils, such pressure of the liquid as would tend to force infection into one or the other of the sinuses must never occur. A simple saline douche for the nose and a soda and salt gargle for the throat will usually prove satisfactory. The nasopharynx may be well cleaned with a warm boric acid solution, If there is no purulent discharge from the nostrils, it is inadvisable to spray or douche them, as much harm can he done from too strenuous or unnecessary treatment of the nose.

E. Skin .- Whatever the temperature, hot sponging for cleanliness once or twice a day is soothing and advisable. Sponging with alcohol in any form is inadvisable. Alcohol, unless the solution is so dilute as to represent not alcohol but only an alcoholic odor, will tend to dry the skin, cause more itching, and more dis-Sponging with sodium bicarbonate in warm water lessens the irritability and stops the itching. Powdering with some soothing talcum powder also stops itching and quiets the patient,

As soon as the acute eruption is over and desquamation is about to begin, gentle rubbing into the skin of some bland oil, as cocoanut oil, almond oil, or wool fat, sometimes with a little glycerin and water, hastens the removal of the dried epithelium, prevents the scales from flying about (although these scales do not carry the infection) and is very quieting to the patient, by preventing the irritation and itching. As soon as convalescence is established, a more active massage of the skin and muscles is advisable.

The use of mercuric chloride or phenol solutions of any strength, or phenol ointments, on the skin, is inadvisable. Most of these solutions tend to dry the skin still more; and the use of phenol ointment might result in some absorption and therefore is of danger to the kidneys. Also, as it seems to be a fact that infection is not spread by the skin, there is no excuse

for germicidal ointments or applications.

Unless the temperature has been very high and head symptoms are present, it is unnecessary to cut the hair close to the scalp. If the scalp itches, as it often does, a little petrolatum may be rubbed into it and will give relief. Oil of eucalyptus has been recommended and used as a nonirritant application to the skin and scalp. Also, throats have been swabbed with oil of eucalyptus preparations, in the belief that eucalyptus oil is especially antiseptic in throat contagions.

F. The Heart.—Cardiac stimulation, especially in children, is rarely needed in this disease. The toxin of scarlet fever is not as depressant as is that of diphtheria, and strychnine is generally unwarranted as it causes too much cerebral stimulation, especially in children. On the other hand, sudden death has occurred in scarlet fever as a result of placing too much effort suddenly on a heart injured by long sustained fever and toxins. Patients should be guarded closely against this possibility and convalescence should be prolonged and generous.

If joint complications occur, there is likely to be an

endocarditis, and perhaps chorea may develop.

Observations made by various organizations for the prevention and relief of heart disease indicate that long periods of pyrexia and rheumatism have a definite bearing on subsequent heart conditions. The most important factor, after early attention to acute conditions, in preventing such heart disturbances is a properly guarded and controlled convalescence. The nutrition and personal hygiene should receive special attention.

G. Late Complications.—Middle ear inflammations should be expected and watched for, and a possible focus of infection in the nose or throat should be sought. The drums should be punctured early if there is inflammation, and the services of an expert on diseases of the nose, throat and ears should be sought by the physician, if such complications occur. The ottits media of scarlet fever seems especially prone to result in mastoidist. These ear complications are serious and should if possible be anticipated. Early puncture of the drum is less serious than a later mastoidotomy.

The glands of the neck are almost always congested and enlarged in scarlet fever, and one or more may tend to suppurate. It often seems that the local application of a proper-sized ice bag to a gland, if the patient will tolerate such an application, aborts serious inflammation. However, if such a suspicious gland continues to enlarge, the temperature to rise and the blood counts show an increasing leukocytosis, there is probably pus formation, and the abscess should be opened soon. The surgeon however, often devices that he

prefers to have warm applications for a short time to cause more rapid breaking down of the central suppurating portion of the gland, so that more complete evacuation may occur on incision. The subsequent dressings and treatment of such an abscess are purely surgical. The temperature will generally drop after the evacuation of the pus, unless there is some other localized seroit process.

Although the percentage of occurrence of nephritis in or following scarlet fever is not great, it occurs sufficiently often and is of such seriousness as to warrant that its symptoms be watched for and expected. As has been urged, all drugs that irritate the kidneys and all foods that cause irritation should be withheld. While it has not been shown that meat will cause nephritis, it is not desirable to add meat to the diet in scarlet fever. Many believe that eggs should not be allowed. The withholding of eggs as a preventive of nephritis hardly seems advisable. Some physicians even withhold salt from the food; this does not seem to be of value. Patients may be encouraged to take larger quantities of fluid by supplementing water with citrate solutions or lemonade. This not only aids diuresis but may also be of value in reducing acidosis. If the amount of urine greatly diminishes and albumin appears, there may not be an actual nephritis, but it may be well to attempt to forestall or abort such an inflammation, Hot packs or applications to the lumbar region can do nothing but good. Perhaps the best preventive of nephritis is prolonged rest in bed for at least a week after the fever has ceased, as it seems to be a fact that the better the action of the skin, the less likely are the kidneys to become inflamed; the skin will be warmer, and is likely to be more moist when the patient is in bed than when he is about. Chilling of the body following scarlet fever is an important added cause for the development of nephritis. Also, if the kidneys have been sufficiently irritated to cause a distinct predisposition to nephritis, an increased use of the muscles, whether by playing, exercise or work, too soon after the acute symptoms are over, may so increase the excretory substances from muscle metabolism as to add a very tangible factor to further irritation of the kidneys and consequent nephritis. If nephritis develops, the

treatment should be as described under that heading. It is quite possible that the suprarenal glands at times become infected in scarlet fever and cause some of the symptoms of toxemia and depression. Intramuscular injections of epinephrine solutions may save a failing circulation

H. Convalescence.-As just suggested, the patient should remain in bed one week after the fever has ceased, and the subsequent convalescence should be prolonged and carefully watched. During the acute stage of the disease the urine should be examined daily, to note the first appearance of albumin and how long the albuminuria persists. During the convalescence the urine should be examined at least every other day for two weeks, and once or twice a week for several weeks more. The diet should be increased and most foods allowed, except that it may be well, for at least two weeks, not to give meat. During this period the patient should continue to receive iron. If the weather is cold and damp, special care must be taken that the patient is not exposed.

Just how long the germ of infection persists in the mouth and especially in the nose, has not been determined, but secondary cases can occur when the patient, especially if he has a nasal discharge, has been allowed to play with susceptible children. It was long thought that the desquamating skin was the cause of this late

infection of others.

I. Use of Vaccines .- As it is conceded that streptococcic infection is concomitant with the cause of many of the complications of scarlet fever, vaccine treatment with stock vaccines or autogenous vaccines has been suggested and advised to hasten the eradication of left-over septic processes. There is no good evidence, however, that streptococcic vaccines have any specific influence on the disease itself.

I. Convalescent Serum .- There is a large amount of testimony to show that convalescent serum is of great value in scarlet fever, especially if it is given during the first three or four days of the disease. Serum taken from patients from the third to the sixth or seventh week after the attack is the most beneficial. The potency of the convalescent serum diminishes after that time.

Zingher employed convalescent whole blood, aspirating it from the cephalic vein of the donor, citrating it by adding the blood to a 10 per cent solution of sodium citrate in the proportion of 1 ounce of blood to each cubic centimeter of the citrate solution. The needle is not removed from the donor's vein until sufficient blood (from 4 to 10 ounces) has been secured. It is then injected into the patient, best intramuscularly, the triceps, outer regions of the thighs, the calves and gluteal regions being used. In young children onehalf ounce, in older children and adults 1 ounce, is injected in each place. The injections may be repeated at intervals of four to five days. In early toxic or malignant cases Zingher found frequently a critical drop in temperature, a disappearance of delirium, fading of the rash, improvement of circulation and general improvement occurring rapidly after the injection of the convalescent blood. In later septic cases he found the injection of the whole blood from normal cases to have nutritive and stimulating properties. In septic cases, when the prognosis is doubtful or poor, the treatment should invariably include the administration of this harmless yet frequently efficient remedy.

Only those persons are selected as donors who are free from all suspicion of tuberculosis, have negative Wassermann reactions and have had an uncomplicated, nonseptic course. The blood is drawn with asptic precautions, into a sterile bottle holding 500 cc., through a needle inserted into a vein at the bend of the elbow, from 200 to 500 cc. being taken from adults and proportionately less from larger children. After the serum has separated from the clot it is drawn off, that from three or four patients mixed, and 0.3 per cent of tricresol added. Cultures are made from the mixture. If it proves sterile it is bottled in sterile vials of 30 cc. capacity. Cultures are again made for sterility, the bottles are corked, paraffined and kept in a refrigerator until ready for use.

The serum is injected intramuscularly in doses of from 60 to 90 cc., the site being usually the large

muscles of the thigh.

Weaver remarks that the "almost constant fall in temperature, and especially the rapid improvement in the general condition of the patient immediately after the serum is given, is most surprising." Early administration is insisted on by all who have had experience

with the serum.

It has been found that convalescent serum is of the most benefit in the severe toxic type of scarlet fever. F. M. Meader (J. A. M. A., March 1, 1930, p. 622) reports in a study of 450 scarlet fever contacts given 7.5 cc. of pooled convalescent serum that 2.9 per cent developed scarlet fever, while in a similar group of contacts not receiving the serum 12.8 per cent developed the disease. The immunity apparently lasts no longer than from three to four weeks. He recommends this type of prophylaxis for young children and the infirm who have been exposed and to check outbreaks of scarlet fever in hospitals and other institutions. The Dicks found that if antitoxin is given early in scarlet fever, the rash will definitely fade in twenty-four hours and there will be an improvement in all the toxic symptoms. The subsequent course of the disease depends on the local infection in the throat. The antitoxin does not seem to combat the local infection or such complications as enlarged glands or infection of the ears

P. S. Rhoads and B. M. Gasul (J. A. M. A., June 16, 1934, p. 2005) have observed cases in which the usual dose of convalescent serum administered to susceptible individuals failed to afford passive protection against searlet fever. However, in their experience, the ordinary commercial preparation of searlet fever antitoxin has always afforded complete passive protection in sus-

ceptible persons.

Twenty persons known to be susceptible to scarlet fever were given 10 to 20 cc. of pooled scarlet fever convalescent serum and Dick tested. Only 3 became immediately Dick negative. A large proportion had not become Dick negative several days later. One whose test remained unchanged three days after administration of convalescent serum at once became immune after a prophylactic dose of commercial scarlet fever antitoxin.

J. E. Gordon (J. A. M. A., Jan. 14, 1933, p. 102) has found immunotransfusion superior to other methods in the treatment of acute septic scarlet fever and scarlating anginosa. The results in malignant toxic scar-

let fever are less favorable than with scarlet fever streptococcus antitoxin. Relatively large amounts of blood were transfused; for infants and small children usually from 100 to 150 cc, for older children about 300 cc. and for adults 500 cc. Since the use of immunotransfusion, the fatality rate for 13,003 patients was less than half that for the previous 5,000 cases.

## MEASLES

# THE PROPHYLAXIS OF MEASLES

Measles is a disease to which practically every person who has not already suffered an attack is susceptible. It is one of the most contagious of diseases.

It seems almost invariably true that one attack of the disease is protective, though a second, third, and even fourth attack sometimes occurs. It is possible that many of these so-called repeated attacks are some other disease, as German measles, or eruptions due to food poisoning.

It has been observed that children under 6 months of age are less likely to contract this disease than older children, and that extremely old people are also less susceptible. It seems to be a fact that the disease is most disastrous in its effects on infants, on persons who are tuberculous or who have any tendency to tuberculous, on those who are debilitated from any cause, and on women who are pregnant or who have recently been confined.

Efforts should be made, therefore, to isolate children who are suffering from measles in order to prevent the spread of the disease.

the spread of the disease

Scott and Simon (Am. J. Hyg., January 1925, p. 109) confirm the belief that the virus or germ of measles is in the masal discharges, but that the infective ability is soon killed by sun and by light; hence, they doubt that the infection occurs from dust.

It is questionable whether the germ of measles alone can cause death; most deaths during measles are caused

by pneumonia.

The contagious material of measles appears to have less vitality and to resist the ordinary measures of disinfection, including sunlight and fresh air, much less than does the infection of scarlet fever. It seems to exist in the secretions from the nose, throat and mouth, and the disease seems to be especially contagious during the period when the catarrhal symptoms are manifest but before the cutaneous eruption appears. This increases the difficulty of enforcing efficient quarantine. When the disease is prevalent, children who show symptoms of cold in the head should be suspected of having measles and carefully watched, but at the beginning of an epidemie it is unusual that a child will be placed in quarantine before the eruption has appeared. The Koplik spots appear in the mouth within three days before the catarrhal symptoms develop. Their appearance should be an indication for immediate quarantine.

The measures applicable to cases of measles may be

briefly summarized as follows:

The isolation of the patient in a remote room of

The selection of a single immune person to care

for the patient.

The wearing by the physician of a linen or rubber coat when he visits the patient, which is removed outside of the patient's door.

The destruction of books and toys which have been

used by the patient, at the end of the period of

quarantine.

The disinfection of dishes and clothing before they are removed from the sickroom.

At the end of the period of quarantine, which in the

At the end of the period of quarantine, which in the case of measles unattended by complications should be two weeks, the bathing and shampooing of the patient and dressing him in fresh clothes.

The disinfection of the room, after it has been vacated, by exposure of the room so far as possible to

fresh air and sunshine.

Sunshine and light are essential to the killing of the germs of all disease, and especially of measles; hence the room of a patient suffering from measles should only rarely be kept dark during the day. The patient's eyes may be efficiently protected from light by blue or smoked glasses.

The prolonged cough of measles after the period of quarantine is over should be treated as though the

patient had incipient tuberculosis.

The secondary respiratory infections of measles are so serious that it may be considered advisable for both patient and attendants to wear gauze face masks. Droplet infection is thus inhibited. In any event special precautions should be taken to protect the patient from such complications.

#### SERUM TREATMENT

Convalescent measles serum has now been tried for a number of years, and its value cannot be doubted Park and Freeman (J. A. M. A., Aug. 21, 1926, p. 556) conclude that: "The injection of 6 cc. of convalescent serum or plasma into a child under 3 years of age and from 6 to 10 cc. for a child over that age who has been exposed for less than five days to measles is sufficient. as a rule, to prevent infection. If it does not, it almost certainly so modifies the attack that it is very mild and is not likely to lead to complications. The serum gives immunity for only two weeks to one month. In the modified cases there is lasting immunity. The serum gives the greatest accumulation of antibody shortly after the convalescence of the patient. At the end of three months, the antibodies are still abundant but probably less in amount"

Haas and Blum (J. A. M. A., Aug. 21, 1926, p. 558) report that convalescent plasma collected from one to four months after defervescence, though perhaps failing to prevent measles, modified the disease in 100 per cent of the cases. Injections after the seventh day following exposure do not prevent the disease. When given early, if the convalescent serum does not prevent the disease it will cause the fever to be lower and of shorter duration, and it prevents complications, especially bronchopneumonia. When the serum is not given till the eighth or ninth day after exposure, J. C. Regan, New York, has found all symptoms to be lessened in intensity and their duration shortened. J. A. Toomey (Am. J. Dis. Child, September 1926, p. 401) gave from 3 to 10 cc. of convalescent serum intramuscularly to 389 persons who were exposed to measles. Of these only 21 developed the disease, and then only in a modified form. A. Zingher found that whole convalescent blood as well as the serum was of value. The later the date since exposure to the disease, the larger

should be the dose of serum. He recommends that for a child 3 years old, the dose should be 2.5 cc. for from one to four days after exposure; 5 cc. from five to six days after, and 7.5 cc. after the seventh day. The dose should be proportionately larger for older children and adults. Adults have been given as much as 30 cc. of the serum intramuscularly or subcutaneusly.

L. H. Barenberg, J. M. Lewis and W. H. Messer (J. A. M. A., July 5, 1930, p. 4) gave 56 of 318 susceptible children, who were exposed to measles, 30 cc. of adult whole blood. Thirteen were fully protected but in 23 an attenuated form of the disease developed.

The injection had no value when given later than the fifth day of the incubation period. Seventy-three per cent of 60 children given convalescent serum were protected. The authors concluded that convalescent serum is the most effective prophylactic measure against measles. The blood of normal adults who have previously had measles is of value in bringing about an attenuated form of the disease and is the most practical method of prophylaxis.

The passive immunity to measles is short, but will probably last through an ordinary epidemic. Young, weakly children and infants should probably be thus immunized when exposed to the disease. The serum of patients convalescent from measles does not seem to be of any value until about ten days after the tempera-

ture has dropped to normal.

The injection of 4 or 5 cc. of blood from a parent who had measles, even in infrancy, will prevent measles, if given early in the incubation period. Generally speaking, convalescent measles serum injected intramuscularly within four days after exposure will prevent measles in most of the cases. When the seventh day of the incubation period has passed protection is uncertain, and after the eighth day or later practically no protection results. The dosage may be summarized as follows: In a child of 3 years or under, 5 cc. of the serum should be injected intramuscularly if within four days after exposure; in older children, about 2 cc. more serum should be given for each additional year; in children over 6 years of age, the dose should be at least 10 cc. If the injection is not given until the fifth day

after exposure, the dose should be 10 cc. for a child of 3 or under and from 15 to 20 cc. for older children. If the serum of a parent or other adult is used the dose given should be larger, and if whole blood is injected the dose should be still larger. The injections are given into large muscular masses, such as those in the buttock or on the outer side of the thigh. There is no special technic except that assetip recautions must be observed closely. If whole blood is injected the injection should be made immediately on withdrawal of the blood before coagulation takes place or else the blood must be citrated (add 1) per cent of sodium citrate).

# TREATMENT OF SYMPTOMS

A patient with measles must be isolated. The room must be warm, as these patients should not be subjected to cold drafts or cold air. Chilling is especially harmful in measles, because of the frequency of lung complications. This does not mean that the air of the room should not be fresh and clean, and the ventilation the best possible.

Eyes.—Unless the child is very young and cannot wear colored spectacles, he room should not be dark. Sunlight is as essential for the welfare of surface, with measless as it is in any other disease, absolutely unnecessary, in ordinary cases, to have the room black dark on account of the eyes. If the eyes are inflamed, the child will cooperate and really enjoy using colored spectacles. Of course, when it is time for the child to go to sleep, the room may be dark-ened and the glasses removed.

A saturated boric acid solution may be used as a wash for the eyes, and if it seems advisable, some sim-

ple eyedrops may be used, such as:

| Gm. or C.c. |
| Aquae camphorae | 15 | fl3 i |
| Aquae - 0, sad 25 | fl3 i |
| M. Sig.: Use as eyedrops, three or four times a day.

If the lids tend to stick together after sleeping, they should be gently washed with warm boric acid solution or plain warm water, and before the child goes to sleep the edges of the lids may be anointed with thick white petrolatum. Cough, etc.—The child, if old enough, should gargle several times a day with some simple, warm, alkaline solution. If the child is not old enough to gargle, the throat should be sprayed. The nose should also be sprayed occasionally, if it seems to be occluded by the secretions. It is often best to leave the nose alone in measles. Most nasal douching is inadvisable, as it tends to force fluid or secretions into the custachian tubes.

In these patients some simple expectorant mixture may be given, although many physicians are losing faith in the activity of so-called expectorant drugs. There is no safe drug that promotes the secretion of the mucous membrane of the upper air passages and bronchial tubes more than does ammonium chloride. It is of advantage in causing the cough to be less dry, and therefore adding the expulsion of any mucopurulent matter that may be in the trachea and bronchial tubes. If the cough is excessive from irritation, a sedative may be added to prevent the unnecessary coughing. A child 5 years old may receive:

		Gm. or Cc.	
$\mathbf{R}$	Codeinae sulphatis  05	gr.i	
	Ammonii chloridi	3 i	
	Syrupi tolutani 50	fl5 ii	
	Aquae	fl3 iv	

M. Sig.: A teaspoonful, in water, every two or three hours when the child is awake.

If the child's cough is not excessive or irritating, the codeine may be omitted from the mixture. As soon as the expectoration is more free and there is no excessive amount of coughing, the medicine may be stopped. A child 10 years old should receive twice the amount of codeine sulphate, and the ammonium chloride should be increased to 5 Gm.; if deemed advisable, the sour syrup of citric acid may be substituted for the sweet syrup of tolu in amount of 25 cc. to the 100 cc. mixture.

Because of the frequency of bronchopneumonia following measles all lung symptoms should be carefully watched. Bronchopneumonia and tuberculosis are among the more frequent sequelae of measles. Onset of bronchopneumonia usually takes place a few days after appearance of the rash, though it may occur in DIET 8

the prodromal stages or during convalescence. The usual duration of such pneumonia is from a week to ten days, and the temperature varies with the severity and extent of the pneumonic process. Chronic pneumonia, which runs a protracted course of many months, may follow measless.

Measles is also credited with arousing into fresh activity a dormant tuberculosis. During an attack of measles the cutaneous response to a tuberculin test that has previously been positive may become negative, and the test may not become positive again till some time after convalescence. This depression of the tuberculin test during measles was termed anergy by Pirquet. Similarly it is known that the Wassermann reaction in a case associated with measles may become negative during the morbillous eruption and positive again after the measles rash has faded. A positive Widal reaction may become negative during an attack of measles. A depression of the skin response to tuberculin during the acute stage of other infectious diseases also may occur. In the cases under consideration, in which both mothers were known to be actively tuberculous, one would be forced to suspect strongly that the measles in these children had reactivated a dormant tuberculosis. Had a tuberculin test been performed during the acute stage of measles, a negative reaction would have been of little value in aiding the diagnosis. The tuberculin reaction is often depressed in fulminating types of tuberculosis in childhood, especially in the late stages of a miliary tuberculosis.

Bowels.—In the beginning of the disease, the child should receive a dose of castor oil, or some cascars, the bowels should be thoroughly and well moved. Minute doses of calonel frequently repeated should not be given, as such dosage causes irritation, and medication may cause an enteritis, a not infrequent complication of measles. Subsequently the bowels may be moved daily with some gentle laxative, if needed.

Diet.—The food depends on the temperature and should be milk and cereal gruels as long as the temperature is elevated. As soon as the temperature becomes normal, the child should receive good nutritious food, and plenty of it. It is inadvisable to give meat in any form, including broths, as long as the eruption is present. If, as has been suggested, the eruption in measles is caused by some irritant circulating in the blood, such as occurs in urticaria, representing a sort of anaphylaxis, the proper diet comprises cereals, milk and plenty of water.

Fever.—The fever rarely calls for much treatment. If it is high, however, one or two doses of an antipyretic will generally be sufficient to reduce it. Amidopyrine which recently has been used extensively in treating measles, is not a specific, according to M. P. Borovsky and F. Steigmann (J. A. M. A., June 10, 1933, p. 1859). However, it is a valuable antipyretic adjuvant in the treatment of the disease. It is given in a dose of 1 grain (0.055 Gm.) for each year, up to 5 grains (0.3 Gm.) three times a day for ages above 5 years. Warm sponging will cool the child as much as cold sponging in measles is inadvisable. Whenever the child is bathed or sponged for temperature, its body should be powdered with some bland talcum.

Skin.—Unless the room is cold and damp, or the patient is otherwise ill, a cotton nightdress will cause less itching and discomfort than would a warmer flannel or silk shirt. All through the illness the nurse should recognize that it is the secretions of the nose and throat that cause infection of others, and not the eruption or extollation from the skin. This does not mean that it is not necessary to sterilize the child's garments and bedclothing, as these may carry the infection from the nose and throat secretions.

Convulsescence.—Prolonged, careful convalescence is essential in measles. Measles, like whooping cough, is often a forerunner of pulmonary tuberculosis, or more acute lung complications. Probably every attack of measles causes enlargement and more or less inflammation of the bronchial glands. If such glands harbor tubercle bacilli, they are stimulated to cause an acute infection. On the other hand, immediately after an attack of measles a patient is doubtless more susceptible to infection from tubercle bacilli. Therefore, before the child is permitted to return to school the cough should have ceased, his weight should be normal, and his nutrition should be good.

Persistent enlarged glands in the neck or elsewhere, and enlarged tonsils and adenoids should all be regarded with suspicion. Such conditions are liable to be accentated by an attack of measles, and proper treatment should be instituted. A suppurating ear must be treated by a specialist until it is pronounced cured and the hearing is as near perfect as possible. The physician should remember that most defective ears follow measles, scarlet fever and influenza; that an acutely infected ear if correctly treated immediately, is generally saved intact. Distention and perforation may occur without pain; consequently, the physician should always be alert to see that the complication of middle ear inflammation is immediately treated.

# WHOOPING COUGH

The great mortality of whooping cough is indirect. A large number of those infected die of such complications as bronchial pneumonia, capillary bronchitis and tuberculosis and a few from hemorthages, while chronic debility, anemia, emphysema, and some lesions of the central nervous system are of not infrequent occurrence. In young children and infants, whooping cough causes more deaths than measles, and some statistics show twice as many deaths as measles; 95 per cent of deaths from whooping cough occur during the first five years of life, and the majority of these during the first two years.

It seems to be established that the Bordet-Gengou bacillus is the cause of this disease; that the greatest infectivity occurs during the initial stages of whooping cough; that even during the active paroxysmal stage there is less liability of infection of others, and that in the later stages the causative germ is absent.

The Bordet-Gengou bacillus is a minute bacillus, occurring in large numbers among the cilia of the epithelial cells of the mucous membrane of the trachea and bronchi. The germ does not grow above the larynx, although of course by coughing it reaches these parts.

This disease occurs largely in epidemics and affects young children. Babies are apparently most susceptible to infection. This may be more apparent than real for two reasons: first, because young children, necessarily remaining in the house more are liable to come in contact more frequently with concentrated infected matter if an infected persons comes near them; and, second, because a large number of older children and the majority of adults have probably had the infection and have become immune. However, when an adult or elderly person acquires the disease it is almost invariably severe. The muscular strength of adults makes the paroxysmal coughing of much greater danger; they are more liable to emphysema, heart strain and hemorrhage. They are not so liable to have pneumonic complications. Whooping cough, however, even in adult life, is a not infrequent stimulator of a latent tuberculosis. Often an adult, who is in close contact with a whooping cough patient, and who may have had the disease in childhood, develops a mild form of the disease; at least he has the catarrhal symptoms and coughs, more or less spasmodically. Also, not all patients who have whooping cough whoop. Whether the Bordet-Gengou bacillus is present in these cases has not been determined. It is a fact, however, that ordinarily one attack of the disease renders a person imminne

The incubation period of pertussis is not definitely known, and may vary from two to ten days; therefore, before it is considered safe for a child exposed to this infection to return to school or to play with other children, at least ten days, preferably two weeks, must

have elapsed.

Pathologically, the disease manifests itself by a catarrh of the upper bronchial tubes, trachea, laryax and perhaps pharyax and nose. The secretion is mostly mucus, with perhaps, later, a mucopurulent discharge from secondary infection. A severe paroxysm of coughing, or a prolongation of paroxysms, may cause hemorrhages; perhaps more or less emplysema; always cardiac strain, and sometimes cardiac dilatation; and frequent paroxysms cause anemia and emaciation. Hemorrhages may occur from the nose, in the eyes, or even in the brain.

The cough is laryngeal in type, is at first dry, and later becomes spasmodic and paroxysmal, thus differing from that of ordinary colds; that is, the coughs occur in series, more or less periodically, or in showers. With these paroyxsms there is more or less closing of the larynx, with the attempt at inspiration through a narrowed glottis, which causes the characteristic whoop. These paroxysms increase in frequency as the disease progresses, and are precipitated by any change in the atmosphere and by suddenly breathing in cold air, as by laughing and even by swallowing food. They sometimes occur without any apparent cause, because of irritation from the germ and its consequences. The number of paroxysms in twenty-four hours varies, but there may be as many as fifty. Early in the disease there may a slight fever.

The blood in whooning cough shows an increased

white count beginning in the catarrhal stage. This increase consists of an absolute and a relative lymphocytosis, which is typical of this disease. R. P. Seitz (Am. J. Dis. Child., November 1925, p. 670) found that the increase in the leukocytes may rarely be as high as 100,000. Lasch (Jahrb. f. Kinderh, May 1925, p. 267, J. A. M. A., Aug. 1, 1925, p. 396) believes that as soon as the leukocytosis and lymphocytosis return to normal contagion is at an end, though coughing may long contagion is at an end, though coughing may long contagion is at an end, though coughing may long contagion is at an end, though coughing may long con-

tinue.

Regan and Tolstouhov of Brooklyn (J. A. M. A., April 10, 1926, p. 1116) report on 682 dehenical analyses of the blood in whooping cough; they find a low total inorganic phosphorus and "a lowering of the hydrogen ion concentration of the blood," and believe that acidosis is associated with the paroxysms. They gave alkalis with marked benefit, and say that if they are given early they abort the disease and cause an early rise in the inorganic phosphorus of the blood. If the nutrition is poor, dextrose should be given.

G. F. Powers (Am. J. Dis. Child., November 1925, p. 632) believes that when convulsions occur in infants with whooping cough, the cause is a tetany due to a

lowered blood calcium.

Doubtless this represents parathyroid gland disturbance.

#### DIAGNOSIS

Louis W. Sauer and Leonora Hambrecht (J. A. M. A., July 26, 1930, p. 263) advise the use of a cough plate for early diagnosis of whooping cough. The most nearly absolute method of diagnosing whooping cough

before the whoop is to let the patient cough on a peri dish, containing a suitable medium, held 15 or 20 cm. from the mouth. No growth on the plate would not exclude the disease, but the development of colonies of the bacillus of whooping cough on the plate would justify a positive diagnosis. This "cough plate" method should be used more than it is in the early diagnosis of whooping cough.

Leukocytosis with a relative increase in the small lymphocytes usually appears in the early part of the convulsive stage and is regarded as a valuable diag-

nostic sign.

## THE PREVENTION AND TREATMENT BY VACCINES

During epidemics of whooping cough, and in schools and institutions where this disease has started, vaccinations with the Bordet-Gengou bacillus have seemed to be successful in preventing the development of the disease.

Vaccines containing Bacillus pertussis alone, and mixed vaccines containing this bacillus, may be obtained for the prevention and for the treatment of the disease.

Vaccines given at intervals during the first two weeks of whooping cough may diminish the severity and frequency of the paroxysms and shorten the duration of the disease. They are of little value, if given as late as the third week of the disease.

L. W. Satter (J. A. M. A., Nov. 4, 1933, p. 1449) noted that hemolysis was usually more pronounced in freshly isolated strains of B. pertussis than in cultures long under cultivation. Since 1925 he has made B. pertussis vaccine according to the Danish Statens Serum Institut specifications, with some modifications as follows: From five to seven recently isolated, strongly hemolytic strains have been selected each time the vaccine has been made, because hemolysis was considered a criterion of virulence. The bacillus is grown on a medium made with fresh, defibriated human blood. The vaccine is diluted with 0.5 per cent phenolized physiologic solution of sodium chloride so that 1 cc. contains about 10 billion bacilli.

Between 1925 and 1928, 100 whooping cough patients and exposed susceptible children were given three injections of this vaccine at intervals of four days (0.5, 0.7 and 1 cc., a total of 22 billion bacilli), as directed by Madsen (J. A. M. A., July 15, 1933, p. 187). Compared with 100 unvaccinated patients seen during that time, no mitigation of symptoms could be attributed to the vaccine. Since 1928, the same type of vaccine has been injected as an immunizing agent in 394 selected young nonimmune subjects. A total of 7 to 8 cc. (70 to 80 billion bacilli) was given, divided into three weekly (bilateral) injections of 1, 1.5 and 1.5 cc., respectively, In the course of five years, 31 control children not vaccinated, in twenty-four of the families, contracted unquestionable whooping cough. Twenty-nine of the injected children were well exposed to the disease but none contracted it. Not one of 162 children accidentally exposed contracted whooping cough. It seems that active immunity is completed in four months and lasts for years. Infants withstand the injections well. The best age for immunization is the second half year of life. Transient rise in temperature and temporary local reactions may occur.

## GENERAL TREATMENT

Unless the patient has considerable rise of temperature, it may not be necessary to put him to bed, but, especially with children, the paroxysms are generally diminished if the child is kept in bed for a time, or at least kept quiet. The more active the child, the more paroxysms. Consequently, even without fever, if a child vomits almost every meal, or if he coughs so severely as to cause hemorrhage, or shows that the right side of the heart is becoming strained (which is the side of the heart most affected), he must be put to bed and remain there. Permanent injury of the heart was not found in a study of 232 children (J. A. M. A., April 4, 1925, p. 1022). This disease in adults may not be so harmless to the heart.

The actual treatment of this disease may be divided into four heads: (1) to prevent the infection of others; (2) to shorten the disease, if possible; (3) to diminish the severity of the paroxysms; (4) to treat complica-

tions as they occur.

The first indication has already been considered.

The second indication is met by general hygiene and by drugs. Fresh air and sunshine, without exposure.

are among the greatest mitigators of this disease. If the weather is pleasant, the child should be outdoors or on a veranda most of the time. If the weather is such that it is impossible to remain outdoors, he should be isolated in one, or better, in two large rooms, so that while one room is being thoroughly aired and cleaned he may go to the other one. There seems to be no question that the more infected or polluted the atmosphere of a room, the more the child will cough. Many observers give outdoor air and sunshine the place of first importance in the therapy of this disease.

The Diet .- If the child vomits a meal as soon as he has eaten it, during a paroxysm he should be given food again in a few minutes with the probability that the next paroxysm will not occur so quickly and the food may remain in the stomach and be digested. A child who is receiving insufficient nourishment for any reason should be given food more frequently. The character of the food should depend on his condition, and should be that which is found to be less frequently vomited. The best diet is cereal and vegetables, with milk and eggs. No substances likely to lower the threshold of nerve excitability, such as tea or coffee, should be permitted. A patient who is not allowed meat should receive a small dose of iron once or twice a day. In cases in which the nutrition cannot be sustained, preparations of cod liver oil and malt are of value

Medicinal Therapy.—Calcium in any simple form may be used as a nerve sedative. Large doses should be given, if there are any symptoms of tetany or convulsions. Hot baths before going to bed relax the nervous system and quiet the patient. Massage also is sometimes soothing. Of course, it is always essential to have the bowels move daily. Plenty of water should be given the child, as the more moist the mucous membranes, the less they are irritated, and the less frequent the paroxysms. For this object many inhalants have been devised. Perhaps the most important element of these inhalants, whether sprays or steam, is the water that they contain. Sometimes bland petroleum oils atomized and inhaled soothether irritated mucous membranes.

Various antiseptics have been suggested. Antipyrine as a spray and gargle has been much used as a germicide in from 5 to 10 per cent strength, and has been much lauded in this disease. Various combinations with thymol, eucalyptol, and other mild aromatic antiseptics, have been employed as sprays and gargles or inhalants. It is quite probable that a creosote or other antisentic inhalant may inhibit the growth of germs in the trachea and upper large bronchi, provided the patient is old enough to cooperate and inhale the vapor into the lungs to that depth. An application in the pharvnx and mouth of hydrogen peroxide solutions, 1:5, is quite efficient. Many times, however, these "antiseptic" inhalants or atomizing substances cause irritation and paroxysms, and must be avoided, while mild alkaline solutions, well represented by one-fourth teaspoonful of sodium chloride and one-fourth teaspoonful of sodium bicarbonate in a glassful of warm water, cleanse and soothe the throat without causing naroxysms.

#### PREVENTING THE PAPOYVEMS

The third indication, namely, to diminish the severity of the paroxysms, is of great importance. It has already been noted that the more quiet the child, the less frequent will be the paroxysms. Also if the child lies down as soon as he begins to cough, he is less likely to vomit. An elastic abdominal belt seems to be of value in controlling the vomiting and the paroxysms of young infants. Several belts especially contrived for this purpose have been described and are available through medical supply houses. In some patients the paroxysms are so severe that chloroform inhalations are given to prevent the intensity of the spasms. It has been shown that inhalations of chloroform lengthen the time between the paroxysms and shorten the disease. However, the frequent administration of chloroform, even in small doses, is known to injure both heart and kidneys.

A most effective medicinal treatment is elaborated with antipyrine. A very good rule for the dosage of antipyrine is 0.15 Gm. (about I grain) for every year of the child's age. This should be given three or four times a day, depending on the frequency

of the paroxysms. It should not be continued indefinitely nor used to excess. Of course, this rule is not applicable for higher ages. The frequency should be dimmished as the intervals between paroxysms lengthen. The antipyrine acts by causing less-irritability of the nervous system and by relaxing muscle sparsn. Although the drug has disadvantages, these are much less than the harm caused by the whooping cough paroxysms.

Frequently the brontides have been given in large does. They act by inhibiting the reflex activity of the nervous system and by more or less dulling the peripheral nerves in the throat and upper air passages. Atropine or belladonna have been given, in large doses; their value is due to the dulling of the peripheral nerves in the irritated part of the body. However, atropine is a stimulant, and cannot have much good effect in this disease, unless the dose is very large, and with such large doses atropine intoxication readily occurs; that is, the pulse becomes rapid, the throat dry and the face flushed, and there is likely to be cerebral excitation and perhaps dilated pupils.

R. Agrelo (Semana méd., Sept. 11, 1930, p. 840) reports good results by peroral administration of ephedrine, giving 0.01 Gm. twice a day, with marked diminution of the cough.

Antipyrine is best given, to a child, in solution, as

day.

This dosage is for a child 5 years old. Antipyrine is

also available in the form of sweet flavored soft tablets

Since 1920 Audrain and Genoese have emphasized the value of intramuscular injections of ether, in doses of 0.5 to 2.0 cc. given every two days. The injection is usually given into the muscles of the buttocks. There may be transient speeding of the heart following administration. Many observers report a distinctly beneficial effect on the paroxysms; however it may cause gangrene at the region of injection and therefore is not a harmless remedy.

W. A. McGee (South, M. J., August 1930, p. 689) has found administration of ether by rectum more satisfactory than other methods of treatment. The usual dose was 2 cc. with an equal amount of oil according to the nearest year of age, given twice daily. To infants under a year, 8 cc. of 25 per cent ether was given twice aday. Children who retained the injections well improved in from seven to fourteen days and good results in the prevention of comblications are reported.

Various hydrotherapeutic measures are often of value, and the hot bath is always useful in quieting the

patient and in relieving internal congestions.

There seems to be good evidence that the application of the roentgen ray (from one to four treatments at five day intervals) to the upper chest of children with pertussis lessens the paroxysma and shortens the paroxysmal stage, hence diminishing the severity of the disease, especially in young children. However, strong exposures should not be given, lest harm be done to glandular structures, notably the thyroid, parathyroid and the thymus, to say nothing of the lymphatic glands.

# COMPLICATIONS

The fourth indication, namely, to treat complications as they occur, is almost supererogation, as each complication calls for its specific treatment. However, under this heading the prevention of such complications may be urged. Vomiting may be prevented by quiet, rest for a while after eating, by the abdominal belt and by proper food. Nutrition must be kept up at any cost, and, if necessary, the child should be given simple liquid nourishment every three hours. Frequently cod liver oil is well borne and is an oil nutriment of great value. Anemia must be prevented by prescribing drugs containing iron. If it is seen that the heart is becoming strained, and the face and throat remain congested even after the paroxysm is over, showing that the right ventricle is in trouble, digitalis should be given and such rest insisted on as is needed by an injured heart. This treatment also tends to prevent hemorrhages. Even if the child is weak and the circulation is weak, strychnine is inadvisable, as it stimulates the nervous system and causes or allows more paroxysms to occur.

If the child has a history of enlarged glands or recurrent colds, or has inherited a tendency to tuber-culosis, or tuberculosis has been present in the child's family, the convalescence after whooping cough should be prolonged, and country or seashore air should be urged where possible. Certainly, such a child should not be confined in school until his nutrition has become as good as before the infection with whooping cough occurred.

#### DIPHTHERIA

This throat inflammation, known for centuries, first appeared in the East and later in Europe, occurring mostly in epidemics. A carrier of this disease may communicate it to persons widely separated. While nearly all mankind is susceptible to smallpox, and a large majority to scarlet fever, many persons seem naturally immune to diphtheria. A closer contact is apparently needed with an infected person than in these other diseases.

This disease has always had a large percentage of deaths, but since the introduction of antitoxin and the use of immunization the death rate has been constantly

on the decrease.

The total diphtheria death rates for eighty-eight cities from 1923 to 1933 is as follows: 1923, 13.13; 1924, 10.84; 1925, 9.67; 1926, 9.40; 1927, 10.36; 1928, 9.24; 1929, 7.82; 1930, 5.12; 1931, 3.74; 1932, 3.21; 1933, 3.23. In New York City antitoxin has reduced the death rate from diphtheria from 150 per hundred thousand in 1884 to about 23 in 1911, and toxin-antitoxin protective injections have cut this 1911 rate, since 1919, to about 8 per hundred thousand, and the yearly number of cases from 15,000 to 7,000. Our best sanitarians believe that for every case of diphtheria recognized, at least one sore throat that carries the Klebs-Loeffler bacillus escapes; in other words, there is an equal number of missed mild cases.

It has been shown that the normal hydrochloric acid in the stomach inhibits or kills the diphtheria bacilli; therefore it is exceedingly rare to find these germs in the intestines, and very rare to find diph-

theritic membrane in the stomach.

In the majority of cases the tonsils are affected in diphtheria, and with the present methods of treatment, in a large portion of these cases the membrane is limited to these regions. The soft palate is next most frequently attacked and the pharynx next. When proper care is taken nasal diphtheria is not very frequent. Laryngeal diphtheria is not a frequent complication of tonsillar diphtheria; when it occurs it generally begins as the original point of attack.

## CARRIERS

Diphtheria carriers may be convalescents, or those who have had contact with diphtheritic patients. The latter group may or may not later develop the disease. The term should perhaps be more properly limited to those who carry the germ for long periods of time. Diphtheria germs may live long on books or other substances that have been handled by a diphtheria patient, or that have been contaminated by coughing, sneezing or expectoration when the patient comes in close contact with such infected material. This method of infection may not be frequent. Animals may carry the infection may not be frequent.

The most frequent location of the Klebs-Loeffler bacillus in carriers who are convalescing is probably the throat, though the bacillus may be found in the nose. In those who carry these germs long, they are more likely to be found in the nose. Therefore, swabs should be taken from both regions. Probably a surface swab from a tonsil may be negative while a culture obtained from probing into crypts of the tonsils or in the region back of the tonsil might show the presence of the germ. It is culpable neglect to fail to examine a patient thoroughly to ascertain whether he is free from the Klebs-Loeffler bacillus.

The boards of health vary as to the number of negative cultures that will release a patient from quarantine. The safest number is perhaps four negative cultures, two from the throat and tonsils, one from crypts or back of the tonsil, and one from the nose, taken on alternate days, at considerable interval after the use of any antiseptic washes, gargles or sprays. Such negative cultures would seem to prove that a patient was free from the Klebs-Loeffer bacillus.

#### TREATMENT OF CARRIERS

The so-called carrier may harbor only the nonvirulent type of the diphtheria bacillus. When the bacilli are present, it may be wise to test them for virulence by guinea-pig inoculation. If the patient carries the virulent type, he must be isolated. A carrier gives a nega-

tive Schick test, as he is immune.

Various methods of ridding a carrier of the diphtheria germs have been tried. Local measures vary: they may comprise painting the suspected regions with tincture of iodine, compound solution of iodine. silver solutions or phenol solutions, or the use of various gargles, such as hydrogen peroxide solutions and the nasal inhalation of various thymol or iodine inhalants or sprays. Whatever else is done, some antiseptic should be applied locally. Diphtheria antitoxin injection has not been very successful for the purpose. Local applications in the mouth, throat or nose of antidiphtheritic serum have not been proved to be helpful. Vaccinations with dead diphtheria bacilli have been only partially successful. Albert reports that a local application to suspicious crypts of the tonsils of a "5 per cent solution of silver nitrate will destroy all bacteria with which it comes in contact." A thorough application of a 10 per cent solution of silver nitrate he finds will cause some destruction of the epithelium of a crypt and a fibroblastic proliferation with ultimate obliteration of the lumen, which is of course the object desired.

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Hektoen and Rappaport found that, when properly applied, kaolin in the form of a dry powder removes not only dipthieria bacilli but also practically all bacteria from the nose in three or four days. For this purpose the kaolin is blown into the nose six or seven times a day at two-hour intervals by means of a rubber bulb attached to a glass tube, the free end of which tapers a little. The insuffation is repeated several times at each treatment. The success of this treatment seems to depend largely on the free and thorough distribution of kaolin over the nasal surfaces. In cases of more or less obstruction of the nasal passages, the removal of bacteria by insuffation is more difficult.

In order to secure the most thorough application of kaolin to the mucous membrane of the throat, patients, if old enough, are instructed to swallow as slowly as possible one-third teaspoonful of kaolin four or five times an hour during the day. In the case of adults and older children, this method, which has been selected after trial of several others, involves no special difficulty. More recently, gentian violet, mercurochrome and acriflavine have been used. Also a series of ether inhalations has been recommended, and the local application of roentgen ray has been advocated. R. Wahl (Deutsche med. Wechnschr., Feb. 13, 1931, p. 276) treated 136 carriers with roentgen rays and obtained negative smears in 96 after the first irradiation. In the others a second treatment was applied from two to three weeks later. Ultraviolet ray treatment has been tried but found unsuccessful.

A careful examination of carriers frequently discloses some local condition which allows the bacteria to live and grow and which prevents their being reached by any local application. Frequently the being reached by any local application and the state of the state

## IMMUNITY

While it has long been known that infants and many adults seem not to be susceptible to diphtheria, only lately has it been shown that probably a large proportion of adults, estimated at 90 per cent, perhaps 50 per cent of children, and probably 80 per cent of newborn infants have diphtheria antitoxin in their blood are therefore not likely to become ill with diphtheria.

A skin test has been devised, known as the Schick reaction, to determine whether or not a person is protected against diphtheria, that is, whether he has diphtheria antitoxin in his blood. It is suggested that, as the Schick test may be negative though the child is not protected, it should be abandoned as a measure

to determine whether the child should be given protective injections and that toxoid or toxin-antitoxin should be given to all children. Formerly it was general practice to give an immunizing dose of antitoxin to persons who had been exposed to diphtheria with the idea that it was harmless. It is now known that even a small primary dose of serum may produce alarming and serious reactions. It may also render the individual sensitive to serum administered subsequently. With the multiplication of immunizing and therapeutic serums and their more general use, it has become apparent that hypersensitiveness to subsequent injections of serum should not be established when it can he avoided. About one third of the children show a negative test (Kellogg: Am. J. Pub. Health, October 1925, p. 868). It may be used following such injections. The Schick test should not be attempted in asthma as severe reactions may occur. Debilitated and sick children should not be given the Schick test. A few of those given toxin-antitoxin injections will later show a positive Schick test reaction. The test is made with a dilute diphtheria toxin of such strength that 0.1 cc. contains one-fiftieth of the minimum fatal dose for a guinea-pig. This amount, 0.1 cc., is injected between the layers of the skin, perhaps best on the inner surface of the forearm. A positive reaction should appear in from twenty-four to seventy-two hours, and is evidenced by a slight swelling and localized redness, a reddened papule which may remain from seven to ten days. When this papule disappears, the skin over it may desquamate slightly, and pigmentation may remain for days and even weeks. The injection is best given with a small hypodermic syringe with a platinum point needle; it must be into the skin and not subcutaneously, and immediately after the injection there should be a raised whitish spot, which in twenty-four hours becomes bluish, with a slight edema. Schick's interpretation of the positive reaction, as just described, is that the patient has no antitoxin in his blood, or at least less than one-thirtieth unit of antitoxin in 1 cc. of blood He declares that all persons so reacting are susceptible to diphtheria. Park, in his summary on immunity in diphtheria, states that according to Hahn the interval between the injection of vaccine and the development of antitoxin is not less than three weeks, while other investigators think that it may be eight days. Persons who have a natural antitoxin show an earlier increased antitoxin production. Von Behring considers that 0.01 unit of antitoxin per 1 cc. of blood is more than sufficient to protect a healthy individual against diphtheria.

Immunizing doses of antitoxin to persons who have been exposed to diphtheria given early, are generally successful in preventing the development of the discase. The immunizing dose for a child should be at least 1,000 units. Adults may receive larger doses.

## IMMUNIZATION WITH TOXIN-ANTITOXIN

Kuttner and Ratner (Am. J. Dis. Child., June 1923, p. 413) have confirmed the observations of other investigators in regard to the transmission through the placenta of diphtheria immunity, if the mother's reaction to the Schick test is negative. If the mother's test is negative, they find that the blood of both the mother and infant shows one-thirtieth unit of diphtheria antitoxin per cubic centimeter as determined by the Kellogg method. They found also that if the mother gave a positive Schick reaction, both her blood and that of her infant showed less than one-thirtieth unit of diphtheria antitoxin. Human colostrum contains only a small amount of diobtheria antitoxin.

Å more durable immunity against diphtheria is established by the use of a mixture of diphtheria toxin and diphtheria antitoxin than by the latter alone. The immunity does not appear until a considerable period of time has elapsed and for this reason the mixture is not useful at the time of an outbreak of diphtheria. At such times it is better to rely on the diphtheria

antitoxin alone.

Ampules of diphtheria toxin for the Schick test ready for dilution with physiologic sodium chloride solution (sterile ampules of salt solution) may be obtained. The dose recommended on the container (from 0.1 cc. to 0.2 cc., depending on the make, of the mixed salt and toxin) should be given intradermally. If the test is positive, showing susceptibility to diphtheria, active immunization is best accomplished with alum toxoid or toxin-antitoxin, as advised by Park. The latter immunization

nizing treatment consists of three subcutaneous injections, at weekly intervals, of toxin-antitoxin mixture (Mulford's 1/10 L + dose). The injections are generally made near the insertion of the deltoid muscle or below the angle of the scapula and consist of 1 cc. doses, or 0.5 cc. if the child is under 1 year of age The development of immunity is slow, and the Schick reaction may not be negative for from one to six months. To produce immediate immunity, diphtheria antitoxin must be used. The toxin-antitoxin mixtures should not be administered within two weeks after an injection of antitoxin.

Toxin-antitoxin may be given subcutaneously or intramuscularly.

## ANATOXIN AND TOXOID

Toxoid and anatoxin consist of cultures of diphtheria bacilli treated with heat and the addition of chemicals such as formaldehyde. The toxoid is given in three injections according to the technic of the Connaught Laboratories of the University of Toronto (Editorial, J. A. M. A., May 24, 1930, p. 708). The doses are 0.5, 0.5 and 1 cc. given at intervals of three weeks. One year is the preferred age for immunization.

William H. Park (Am. J. Dis, Child., December 1931. p. 1439) says that toxoid is improved and now the 0.5 cc. dose of toxoid is somewhat better than the 1 cc. dose of toxin-antitoxin. The present toxoid in equivalent doses gives a reaction in young children of about the same severity as toxin-antitoxin. Therefore, lately there has been a shift to the use of toxoid for immunization in New York. When toxin-antitoxin is properly neutralized and freshly prepared, it is almost as efficient as toxoid, but it deteriorates on standing, so that in small communities the toxin-antitoxin may give but 60 per cent success, while toxoid that is kept for some time will give 85 per cent. It has just been learned that the addition of 0.2 per cent of alum greatly adds to the efficiency of either toxin-antitoxin or toxoid. but especially of toxoid. Apparently, about one fourth of the amount of toxoid with alum gives the same results as the full amount without alum. It is likely that with the alum toxoid only one or two injections may be required, but if one wishes to get as near 100 per cent

of success as possible and a higher degree of immunity, one should use three injections. The practice at present in New York and Chicago is to give toxoid to children from 6 months to 10 years of age and toximantitoxin to those over 10 years. A. H. Graham and his co-workers (J. A. M. A., April 8, 1933, p. 1096) gave a total of 798 children a single injection of alum precipitated toxoid. Of 185 strongly Schick positive children, 171, or 92.4 per cent were rendered Schick negative by this injection. Of 613 children, 96.6 per cent were Schick negative when tested from two to four months after a single injection. The original immunity status of this group was not known, but 72 per cent were pre-school children.

Henry W. Straus (I.A.M. A., July 15, 1933, p. 192) found that a concentrated diphtheria toxoid incorporated in hydrous wool fat when injected intransucularly actively immunized 99 per cent of 103 patients within a period of two months. In the majority of cases immunity developed as early as three or four

weeks, and in one case as early as two weeks.

Alvin E. Keller and Seale Harris Jr. (J. A. M. A., June 30, 1934, p. 2163) believe that toxoid can be safely used for immunizing adults by testing each person intradermally with a skin test dose of dilute toxoid before giving the injections. The skin test dose is 0.1 c. of a 1: 10 dilution of toxoid. If no reaction consisting of an area of redness more than one-half inch in diameter develops within three days, the individual may be given undiluted toxoid in the usual dosage. If a reaction does occur injections of diluted toxoid in increasing dosage should be employed.

#### TREATMENT

A. Isolation.—It should be urged again that spots or a membrane on the throat are suggestive of diphtheria until a negative culture is obtained. Such a patient should be isolated in the best room available, looking toward the possibility of the disease being diphtheria and a nurse being required. Other children of the family must be excluded from contact with this patient. If the case is clinically one of follicular tonsilities, the obviscian may wait for a position.

tive culture before giving antitoxin. If, however, the case is clinically diphtheria, antitoxin should be given without waiting for a report, provided there is nothing in the history of the patient to show that there is any hypersusceptibility to horse serum. For such a case autitoxin in goat serum is now available. Whether it is follicular tonsilitis, or other streptococic infection, or diphtheria proper, gargles and local cleanliness of the throat should be immediately inaugurated, and when this is properly carried out, the danger of infection of others is reduced to a minimum.

It is hardly necessary to discuss again the advisability of sunlight, a large room, an adjacent bathroom and the absence of all unnecessary draperies, furnishings or rugs, for a proper isolation room. Instruction should be given the family in the minor details of the prevention of infection of others. A properly trained nurse well understands the necessity for burning wooden tongue depressors, wooden applicators, the gauze and cotton used around the patient's nose and mouth, and washcloths; the use of liquid soap; simple but effective cleanliness of the patient's face, hands, and body; boiling of all eating and drinking utensils; abolishing the toothbrush during the illness and using cotton swabs in its place; allowing the bed clothing and bed garments to stand in germicidal solution before being sent to the wash; frequent washing of her own hands in germicidal solutions, and gargling her own throat with various solutions.

B. General Care of Patient.—High fever is not frequent in diphtheria, unless the case has been neglected. Consequently, the patient should receive, almost from the beginning, plenty of nutritious food. The exact diet, of course, depends on the age of the patient. Milk, oatmeal gruel, eggs, meat juice well salted, toast, butter, and the whole, or the juice, of one or two oranges, would represent the food needed. With or without meat, it is well to give a diphtheria patient iron, and no preparation is better than the tincture of iron chloride in 5-drop doses, three times a day, given in fresh lemonade or orangeade, after nourishment.

However well the gastric juice inhibits the growth of the bacteria, it is always wise for a patient to gargle, or have the throat sprayed, before taking food, so that the mouth and throat will be as clean as possible. The bowels should be moved daily by some simple

laxative, if they do not move without such help.

While a diphtheria patient should have plenty of fresh air and all the sunlight possible, he should be kept warm. He should not be allowed to become chilled, as the toxins of this disease cause depression and the patient's temperature may be quite low, and the hands and feet easily become cold. Even if the temperature is high, warm sponge baths should be used for cleansing the skin.

C. Antitoxin.-The chief value of antitoxin is in the treatment of developed diphtheria, but it also should be used to immunize an exposed patient. Such immunization will last only a short period. The toxoid will cause a lasting immunization. Recent investigations by Schick show that the dose of antitoxin advisable for ordinary cases of diphtheria can be based on the weight of the patient. Schick finds that 100 units of antitoxin per kilogram of weight is sufficient to combat the toxin in diphtheria in all ordinary cases, and in severe cases 500 units per kilogram is more than sufficient. other words, enormous doses of antitoxin are not needed. This is especially true if the antitoxin is given early. A kilogram equals 21/2 pounds avoirdupois, and a child weighing forty-five pounds, in an ordinary case of diphtheria, should be given 2,000 units of antitoxin; while in severe cases or in nasopharyngeal or laryngeal types. 10,000 units would be all sufficient. By the same calculation of the dose, an adult of about 130 pounds should receive 6,000 units in a mild case, and 30,000 units if the diphtheria is of a malignant type, or has affected parts in which the danger of absorption is greater.

It seems quite probable that if such doses can be administered on the first day of the infection with the Klebs-Loeffler bacillus, no more antitoxin will be needed in such cases, and death from this disease

will be reduced to a minimum.

Smith and Park have shown that when antitoxin is given subcutaneously, it takes from three to four days before the maximum amount of antitoxin is circulating in the blood. If the antitoxin is given intra-

muscularly this period of absorption is shortened. From these observations, therefore, the conclusion should be drawn that if the case is urgent and the toxemia serious, antitoxin should be administered intravenously; if the case is severe and the diagnosis has not been made early, antitoxin should be given intramuscularly; in ordinary or mild cases, and on the first day or two of the disease, it may be administered subcutaneously.

Several considerations make it difficult to state the probability of appearance of anaphylactic phenomena in any given case. In addition to individual peculiarities which no doubt play a part, the volume of serum injected and the method of preparation of the serum are important factors. The recently developed methods of concentrating and refining antitioxin yield serums of high potency, so that the necessary amount of antitoxin is available in small volume of serum, and the probability of serum disease is accordingly decreased. The removal by the refining process of certain albumin fractions of the serum decreases the incidence of serum disease. Older statistics showed a higher incidence of reactions than are being obtained at present with concentrated serum.

In persons receiving serum for the first time, serum disease appears in many cases from the seventh to the tenth day, but sometimes earlier or much later, and rarely need cause alarm. In 200,000 persons injected with serum, there was but one death from anaphylactic

shock (Kolle).

The reactions which follow reinjections of serum (that is, in persons previously injected) may be immediate, but in any case are likely to occur carlier than those after first injections (accelerated reactions). In addition to uriticaria and other symptoms of serum disease, respiratory disturbance, cyanosis or rapid pulse, and symptoms corresponding to those of anaphylactic shock seen after reinjection of experimentally sensitized animals occur usually during an immediate reaction. Epinephrine and atropine have been used with benefit. Even these severe reactions are very rarely fatal. About 50 per cent of the fatalities from anaphylaxis have occurred in asthmatic persons, and in some of the latter the fatality followed the first injection of serum. When

the reinjection is made within six days after the first injection there is practically no danger of anaphylaxis; reinjection in from three to eight weeks after the first injection is followed by some digree of anaphylaxis in about 90 per cent of cases; reinjection after six to nine months is followed by reaction in about 50 per cent of cases (Seidel: München. med. Wichnacher, 1915, p. 1210). With the lapse of years the percentage of reaction on reinjection is further decreased and usually appears as an accelerated reaction. Toomey, Goehle and Dauer (Am. J. Dis. Child., February 1925, p. 214) conclude that antitoxin may be used successfully when given intraperitoneally and used in original package "undiluted with saline solution." This method is valuable in "severe cases of toxic myocarditis,"

Only persons sensitive to both horse serum and horse dander should be regarded as risks for the primary administration of horse serum. If it should be imperative to administer antitoxin in such cases, the greatest precautions should be observed to give the serum exceedingly slowly and by the routes of least rapid absorption, coupled with the use of such drugs as

atropine and epinephrine.

D. Care of the Throat.—It would be just as preposterous to perform a major operation with the most perfect technic, and yet take no means whatever of preventing infection, as to administer antitoxin in proper dosage in diphtheria, and then not take proper care of the throat. All odor and much danger of secondary infection are removed by proper treatment of the part affected. Although germicides cannot kill the germs deep in the mucous membrane, or those that are protected by an overlying exudate, a certain large portion of the surface bacteria are surely killed by as simple a gargle as hydrogen dioxide solution. More irritant germicidal gargles, or germicides that are sources of danger when swallowed, are entirely unnecessary in diphtheria.

If the child is 'old enough to gargle, this method of cleansing the throat may be tried. If the child is not old enough, the throat should be thoroughly sprayed. A solution of one part of the official solution of hydrogen dioxide to three parts of warm water, freshly propared each time, may be used as a gargle, every one and one-half to two hours during the day, and every three hours during the night. Three or four minutes after this gargle has been used, it should be followed by some simple alkaline wash such as a teaspoonful of boric acid added to one-half glass of warm water to remove the irritant effects of the hydrogen dioxide. This will not all dissolve, but will deposit on the throat and act as a mild antiseptic. Also, there is no greater promoter of mucous secretion of the throat than boric acid: and the more mucus is secreted, the quicker will the membrane be loosened. A simple solution made with one-fourth teaspoonful of salt and one-fourth teaspoonful of sodium bicarbonate added to one-half glass of warm water may be used. The object of such a gargle and wash is to cleanse the mouth and throat of froth and pieces of membrane, mucus. mucopus, etc., and to soothe the membrane.

After the throat has been cleansed, it may be of value to apply tincture of iodine to the membrane or exudate. Care must be taken not to touch the healthy membrane with this solution. Compound solution of iodine may be applied to the parts of the throat that are not affected, which often tends to prevent development of more exudate or membrane. If there are pockets and crypts in diseased tonsils, after these are cleansed boroglyceride may be applied to heal and to prevent

spreading of infection.

As frequent gargling is tiresome for the throat, swabbing should be suggested. If the child is too young to gargle, the dioxide should be sprayed on, and the solutions for this purpose should be stronger, namely, 1 part to 2 parts of warm water. The cleansing spray may be used afterward. If the throat and mouth generally are irritated, a soothing gargle which may be employed is:

	Gm. or Cc.		
$\mathbf{R}$	Acidi borici	gr. xxx 3 iss	
	Potassii chloratis 5 Aquae menthae piperitae 200	fl3 vii	
M.	. Sig.: Use undiluted as a gargle, as direct	ted.	

Of course, any flavor could be used in this mixture to replace the peppermint.

Cleansing mild alkaline solutions or boric acid solutions represent a useful treatment of nasal diphtheria employed as sprays or snuffed through the nostrils. Such mild, warm solutions may be poured from a small vial or from a teaspoon into the nostril, with the head thrown back. It is inadvisable to use any of the douches that are on the market, or any syphon douche, as the pressure is too great, and fluid is often forced the the custachian tube or into some of the sinuses. Also, the nose should not be sprawed too often.

As soon as the throat is clean, the frequency of the gargles should be diminished, but for several days the patient should be awakened at night to gargle at least

once or, preferably, twice.\*

E. General Medication.—Unless complications occur, a patient with diphtheria requires very little general medication other than antitoxin. In the beginning a small dose of calomel, or a dose of castor oil, and subsequently whatever simple laxative is needed to cause a daily movement of the bowels may be advisable. Measures for reducing the temperature are not often required. If it is high, or there is headache, backache, and general aching, two or three small doses of a coal-tar antipyretic may be given. The following combination for a child not under 10 years old is efficient:

Gm. or Cc.

B Acetphenetidini 1 Phenylis salicylatis 1 ãã gr. xv
M. et fac chartulas xv.

Sig.: A powder every three hours, if needed.

Later, if the temperature is high, tepid sponging is sufficient. Generally, with the ordinary low temperature of diphtheria, hot sponging for cleanliness, to increase the activity of the skin, and to remove the perspiration, should be done once or twice daily.

As suggested every patient with diphtheria should receive iron, either the tincture of iron chloride, a few drops in fresh lemonade, or 0.10 Gm. (1½ grains) of reduced iron, in causule, three times a day. If there

<sup>\*</sup>The treatment of the throat advised for diphtheria is equally applicable to follicular tonsillitis or scarlatinal throats, and to septic sore throat.

in some form and more milk, should be added to the diet A little coffee or tea as a medicine may be given a

child for the action of the caffeine and is of value.

F. Care of the Heart .- Although it was long considered that heart failure in diphtheria was due to vasomotor paralysis or to action on the vasomotor center, it has been shown by Porter and Pratt that such is probably not the case. Heart failure is due perhaps to the action of the toxins on the heart itself. Myocarditis is not an infrequent complication of diphtheria; valvular disease may occur from diphtheria, and even a chronic myocarditis may persist, or a valvular lesion may continue for months, years, or even for life. The mitral valve is the one most frequently diseased. and if a lesion is caused, it is generally insufficiency. About 60 per cent of the patients with diphtheria show an irregular pulse, and the younger the patient, the more liable he is to have this heart irregularity. It may occur even in mild cases. The murmur at the apex is doubtless due to a relative insufficiency of the mitral valve, because of slight dilatation of the left ventricle In this investigation, necropsies showed that endocarditis and pericarditis are not extremely rare complications in diphtheria.

H. M. Marvin, New Haven (Am. J. Dis. Child .. April 1925, p. 433), finds that diphtheria causes toxic myocarditis and death from heart failure. Electrocardiograms showed "disturbances in auriculoventricular or intraventricular conduction. Sinus arrhythmia occurred invariably in young patients with heart rates

below 95 per minute."

Vomiting, enlargement of the liver, and a change in the character of the first heart sound are signs of myocardial trouble. "Necropsy in 5 cases revealed wide-

spread myocarditis."

Clinically, the gallop rhythm, with or without vomiting and epigastric pain and tenderness, is a bad symptom in diphtheria. This gallop rhythm of the heart is very serious, and if accompanied by vomiting, the prognosis is very bad. Hume and Clegg, after an investigation of 573 cases of diphtheria, declare that any form of arrhythmia of the heart (except sinus

arrhythmia) in diphtheria indicates that the heart muscle or nerves are pathologically disturbed. This may After a patient is apparently well from diphtheria,

occur even when the diphtheria seems mild.

if he has been severely ill, and especially if the case has been neglected and a large amount of toxins has been absorbed, cardiac failure may occur any time from the second to the fifth week. A symptom of late cardiac weakness is often a slow, weak pulse. Such hearts, however, become rapid on the least exertion, and these patients are sometimes very pale, and are liable to have gastro-intestinal disturbances.

The effects on the heart in diphtheria are due to the Klebs-Loeffler bacillus toxins; consequently, if antitoxin in sufficient dosage is given early, the toxic effect on the heart will probably rarely occur. Consequently, death from heart failure in diphtheria will be less frequent with the early proper administration of antitoxin.

The most important treatment of cardiac complication is rest. A patient who has shown cardiac inflammation of any kind, or cardiac irritation during diphtheria, should have a prolonged rest in bed and a slow convalescence. In an apparently acute heart failure, a fair-sized dose of strychnine, one-fortieth grain for a child 10 years old, may be given hypodermically; but to persist in large doses of strychnine is inadvisable. Digitalis is not indicated, and alcohol should not be given. Caffeine and camphor may be worth while; but the principle thing is absolute rest, small amounts of food, and the least possible disturbance for bathing feeding, defecation and urination, and no prostrating purgatives.

Martmer (Am. J. Dis. Child., June 1927, p. 895) believes from his work and his review of the literature that in severe cases of diphtheria Bacillus diphtheriae

may enter the blood stream.

The septic type of diphtheria may be caused by a streptococcic septicemia complicating the diphtheria; while hemorrhagic diphtheria, Martmer holds, is probably due to a Bacillus diphtheriae bacteremia.

G. After Rest .- A patient who has recovered from diphtheria, however mild it may have been, should have, for the first two weeks, at least, a carefully watched convalescence. Strenuous exercise should be the disease

avoided, and the heart should be carefully examined before the patient is allowed to return to his usual work, school, or play.

H. Paralysis.—With the early injection of a sufficient dose of antitoxin, paralysis from dipltheria has become less frequent. Nevertheless, many cases of paralysis, especially in dipltheria of adults, occur in spite of the use of antitoxin. Fortunately, paralysis of the soft palate, which used to be so frequent, is now infrequent, but when it occurs it has a very bad prognosis. More antitoxin should be given if paralysis develops. Paralysis generally occurs between ten and twenty days after the onset of the illness. Paralysis of the diaphragm may occur and still not be fatal. It must again be emphasized that prevention of all paralysis or multiple neuritis from diphtheria is favored by the administration of a sufficient dose of antitoxin early in

Proper treatment of diphtheria paralysis and of multiple neuritis generally causes recovery, although it may be slow. The treatment consists of tonics, small doses of strychnine, the best of nutrition, fresh air, sunlight, and prolonged rest during convalescence. The general paralyses, which are now rarely seen, are more serious, and occur later. Recovery from them is slow, and besides general treatment, require massage and electricity.

I. Diseased Tonsils.—It is quite probable that diseased tonsils cause a susceptibility to diphtheria, as they certainly do to follicular tonsillitis. After complete recovery from diphtheria, when the general condition is perfect, and the heart is in good condition, all tonsils that show disease should be removed. Acute nephritis not infrequently follows any kind of streptococcic infection of the threat

### LARYNGEAL DIPHTHERIA

Membranous croup is laryngeal diphtheria. As soon as it is found that there is exudate in the larynx or laryngeal region, antitoxin should be given in large dosage (at least 10,000 units, and if necessary repeated in six hours), without waiting for a decision from the laboratory that the Klebs-Loeffler bediltus is pres-

ent. The only safe place for a patient with laryngeal diphtheria is a contagious disease hospital, where expert skill in intubation and, if necessary, in tracheotomy can be quickly obtained. The great danger from diphtheria in this location is suffocation.

Every means should be taken to keep the person who has laryngeal diphtheria quiet, and if necessary narcotics should be given; thus intubation and tracheotomy

may be avoided.

The toxemia is not great, and the absorption is much less than in nasal, nasopharyngeal, or even tonsillar diphtheria.

The best of nutrition is important, as exhaustion from labored breathing is likely to occur. The atmosphere of the room is better moist, because when the membrane becomes dry it causes more obstruction before it loosens and is coughed up. Just how much local steaming of the throat, or inhalation of various medicated solutions should be given, is to be decided by the individual physician. The main advantage from these measures is doubtless from the vapor of water.

The principal requirements to be remembered in treating laryngeal diphtheria are: the administration of an immediate large dose of antitoxin; intubation by a skilled operator as soon as indicated; a trained nurse skilled in intubation cases, if such can be obtained; the ability to recall quickly the physician who intubated if the tube is coughed up; the immediate removal by the nurse of the intubation tube if it plugs up, and the quick performance of trachectomy by the surgeon, if such a measure is needed.

Lyman G. Richards (J. A. M. A., Sept. 13, 1930, p. 766) advises direct laryngoscopy in diphtheritic laryngitis and the use of suction to remove the membrane. Then, if required, the intubation tube may be inserted directly.

## SEPTIC SORE THROAT

The cause of this disease is a hemolytic streptococcus and the source of the infection is generally a contaminated milk supply. A case of sore throat in one milk handler may cause the milk to become infected, but may times there are several employees on the same farm who will be found to have sore throats. It is self-evident that one who is ill, especially with a cold or sore throat, should under no circumstances handle milk. Cows are not made sick with this disease, but the udders become infected and they become carriers.

Pasteurizing milk stops its ability to carry this infection, and the elimination of the infected handlers of the milk or the cure of their throats and the proper treatment of the infected cows' udders generally stop infec-

tion of the milk quickly.

The clinical symptoms are the same in all epidemics of the disorder. The disease may be mild or very severe and not infrequently is fatal. The throats generally show intense hyperemia without a grayish exudate. The cervical lymph glands enlarge, and may suppurate; there is extreme prostration, and a tendency to relapse. The complications are inflammation of the middle ear, abscess around or about the tonsils, and erysipelas or other skin eruptions. The most dangerous and fatal complication is peritonitis, and there may be fatal septicemia, with localization in the lungs. Endocarditis, myocarditis, arthritis and nephritis may occur as complications in this septic process.

Means of prevention of septic sore throat in epidemics must include a more frequent bacteriologic examination of the udders of cows and of the throats

of those who handle raw milk.

I. Pilot and P. Rosenblum (Am. I. Dis. Child., November 1932, p. 994) unde a bacteriologic study of the throats in children during the winter and spring of 1931. They found that 9 of 102 children with sore throat yielded the streptococcus epidemicus; 50 others yielded ordinary hemolytic streptococci. The sore throat due to Streptococcus epidemicus was sporradic and not related to the milk supply. Complications and sequelae were common in those infections due to Streptococcus epidemicus due to Streptococcus epidemicus.

The treatment of septic sore throat is the same as that of follicular tonsillitis, namely, application of dilute hydrogen dioxide solutions 1:4 and immediate subsequent washings with mild alkaline cleansing solutions.

On account of the prostration, the patient should receive plenty of nutriment. The bowels should be moved daily. Pain should be stopped, if it is trouble-some, by codeine or morphine, if deemed advisable.

High temperature should be treated as seems best, and the complications combated as they occur. Infection of others is prevented by the same methods as those described for diphtheria. After recovery, the removal of infected tonsils should be considered

# RUBELLA (GERMAN MEASLES)

This is a highly contagious disease, most frequently affecting children and youth. It generally occurs in epidemics, but a considerable number of persons exposed to the disease do not acquire it. While the germ has not been discovered, and though it is not known just how it is transmitted, the probability is that the secretions of the nose and throat are the means of spreading the infection. It is doubtful whether the eruption or the desquamating epithelium carries the contagium.

According to Gustaf Lindberg (Acta pædiat., October 1924, p. 1; Am. J. Dis. Child., February 1925, p. 266), who studied a thousand cases of German measles, the incubation period is from seventeen to twenty-one days. Leukopenia is generally in evidence, but the differential count is normal. The disease may occur without an eruption. The stage of invasion is rarely seen, as the eruption is present when it is first realized that the patient is ill. The eruption is a maculopapular one, reddish, and rarely confluent. The papules are less raised than in measles; in fact, many points of eruption are purely macules. The color is brighter than that of measles. It occurs first on the chest and face. and then gradually spreads over the body, during the first twenty-four hours. The eruption may be differentiated from that of scarlet fever by the moist skin present in rubella. In scarlet fever the skin is dry. Questioning of the patient often elicits the fact that there were slight rigors and some backache or headache or feelings of indisposition. The temperature is generally slight, rarely above 100 F. Occipital adenitis, with swelling of the postcervical glands, is a very frequent accompaniment of the disease.

K. Stolte (Monatschr. f. Kinderh., November 1929, p. 206) believes that profuse sweating on the penultimate night before the appearance of the exanthem is of

more frequent occurrence than is generally supposed

and is a diagnostic symptom of importance.

Complications are rare. Although the patient should be confined to the house, the infection is simple, and there are not likely to be sequelae.

#### TREATMENT OF RUBELLA

Ordinarily, this disease requires no radical treatment. Simple cathartics should be given, the diet reduced, and the patient kept indoors until the eruption has disappeared. If the throat is irritated, an alkaline gargle should be used. Boric acid solution, 2 to 4 per cent, or Dobell's solution, one-fourth strength, may be used for this purpose. The usual simple methods of preventing the infection of others should be carried out. It is well to isolate the patient from other children in the family for at least three weeks.

The disease is often confused with regular measles. and, occasionally with mild scarlet fever. It is even more likely to be confused with various kinds of intestinal or food poisonings that cause eruptions.

# CHICKENPOX: VARICELLA

This simple, acute, contagious disease, generally very mild, and rarely requiring any medication or treatment,

is frequently confused with smallpox.

In chickenpox the incubation period is at least two weeks. There is no definite history of a previous attack of this disease. A history of successful vaccination within a few years, or a definite history of a previous smallpox, justifies the assumption that the disease is chickenpox. There is usually no history of a stage of illness before the eruptive stage. The blood is not much changed in young children. There may be a slightly increased white count, 2,000 or 3,000 above normal. The differential count is normal. N. Carrara (Pediatria, Aug. 15, 1930, p. 865) reports that in the period of incubation there is a relative lymphocytosis with neutropenia, and in the exanthematic period, leukopenia in 50 per cent of the cases and relative lymphocytosis with neutropenia. In convalescence there is a reactive leukocytosis which may begin before disappearance of the exanthem.

O. Lade (Minchen, med. Wchuschr., Aug. 4, 1933, p. 1215) has found that many children have a diarrheal or an extremely thin stool two weeks before the manifestation of the eruption of chickenpox. He thinks this observation should be an inducement to isolate such a child. He also thinks the diarrheal stool may indicate the intestine as the portal of entry for the disease.

The eruption appears in the first twenty-four hours of the disease beginning on the back, chest or face, and is most profuse on the parts of the skin covered by clothing. The eruption appears in successive crops on successive or alternate days, so that various stages of the lesions may be present at one time. The lesions are round and oval, and the margins are not crenated. The eruption passes through the following stages: 1. Macules lasting a few hours. 2. Soft, superficial papules lasting a few hours. 3. Clear, thin-walled, tense vesicles each lasting a few hours (these vesicles may be readily broken and appear cupped or pitted, and the weeping vesicle then quickly becomes crusted). 4. The crusts which last a shorter or longer time, depending on the treatment (each crop completes its cycle from macule to crust in from two to four days). 5. Pitting may occur, but the pits are few, superficial, and often oval.

There is evidently a close relationship between chickenpox and herpes zoster. Varicella in one person may be followed by herpes zoster in another who comes in contact with him. R. R. McCormick, (J. A. M. A., March 7, 1931, p. 766) reports 4 cases of herpes zoster among persons in contact during an epidemic of chicken-pox. During the course of herpes zoster in one case, a generalized vesicular eruption developed on the twelfth day.

Of 13 infants who were exposed to chickenpox, 5 were given an injection of 30 cc. of whole blood and 8 were given 40 cc. of blood serum by J. M. Lewis and L. H. Barenberg (N. Y. State J. Med., Jan. 15, 1933, p. 97). The infants who received the whole blood developed chickenpox in a mild form, but those who received the serum did not succumb to the infection.

It is essential that cases of chickenpox should be diagnosed early, and that the patient should be isolated. A laxative should be given; the diet should be simple; warm baths, and powder to prevent itching, represent the only treatment generally required. Older patients should be cautioned, and children should be prevented from picking open the vesicles that occur on the face, thus preventing pitting. Young children should wear celluloid mittens. To control the tiching of the skin, it may be dabbed with a weak solution of sodium bicarbonate. I drachm to the pint or 4 Gm. to 500 cc.

In cases in which the varicella lesions undergo suppuration, numerous complications may occur. The most severe is a general septic infection, usually with high fever and associated with a severe and fatal course; or bronchopneumonia may occur, with a similar result. The addition of potassium permanganate to the bath water has been recommended. The child should be bathed in such a solution once or twice daily and should be allowed to remain in the bath ten or fifteen minutes, or at least as long as he remains comfortable in it.

On account of the exhausting and debilitating effects of this diffuse suppurative process, every attention should be given to the nourishment and general hygiene of the child and to such supporting measures as may be indicated.

### MUMPS

Mumps is a highly infectious disease, with a long period of incubation-from two to three weeks. The causative organism is not known, though a diplococcus or streptococcus has been found by Laveran, Catrin, Herb and Rosenow. Wollstein found that the saliva of those infected contains a filtrable infective agent. The virus is most readily detected in the saliva during the first three days of the disease, less readily on the sixth day and not at all after the ninth day. This has some bearing on the question of infectivity and the length of the isolation period for patients with mumps. There is more or less mumps always present in most cities, and there are likely to be epidemics of it in certain seasons of the year, more particularly in the spring and fall. Children and youths, especially boys and young men, are most susceptible. Infants and adults are less likely to have mumps; adults probably have been rendered immune by unrecognized mild attacks in childhood.

While the typical localization of this infection is in one or both parotid glands, the submaxillary glands may be coincidently involved, or may be the only glands involved. As simple and harmless as this disease generally is, it may cause very high temperature, sudden cardiac failure, and frequently in young boys and male adults, orchitis, which is always serious. In girls the mammary glands or the ovaries may show metastatic inflammation. Walter D. Bieberbach and Foster Vibber (J. A. M. A., April 8, 1933, p. 1092) report, a case of orchitis due to mumps without the involvement of the parotid or other salivary glands. Orchitis practically never complicates mumps before puberty. Most of the susceptible children, at least in the cities, have had mumps before the age of puberty. Consequently the only opportunity to collect statistics on the testicular complication would be epidemics in army camps or similar places. M. J. Radin (Arch. Int. Med., September 1918, p. 354) records such an epidemic. There were 4,397 cases, 13.91 per cent with testicular complications. In only one sixth of these, or about 16 per cent, was the orchitis bilateral. W. P. Lucas in Oxford Medicine states that "usually only one testicle is involved, which is fortunate, as atrophy of the testicle generally follows and involvement of both testicles results in sterility."

A patient with the disease should generally be isolated, and the attack will often be milder if the patient remains in bed. Of course, an infected child, even though very mildly sick is immediately sent home from school. On the other hand, doubtless not a few children with very mild cases are unwittingly allowed to remain at school.

J. C. Regan (J. A. M. A., Jan. 24, 1925, p. 279) says that convalescent parotitis serum will immunize exposed susceptible persons, but it should be given before the seventh day of exposure. The dose is from 2 to 4 cc.

#### TREATMENT

The disease is sometimes so mild that it may not require special treatment. Pain in the infected glands is rarely severe, and is modified by dry warmth or simple absorbent-cotton applications, and by any oily application, the latter to relax the tension of the skin over the swollen gland. For this purpose olive oil may be used, or petrolatum, or an ointment may be made with 10 per cent methyl salicylate in petrolatum. It is inadvisable to use ice or cold anolications to the

parotid glands in mumps.

The diet should be mild, and the bowel movements kept free. In simple cases medicinal treatment is not needed. If the fever is very high, one or two doses of antipyrine or acetanilid may be given, with the knowledge that cardiac depression readily occurs in this disease. Hot drinks, such as hot lemonade or tea, with perhaps the powder of ipecac and opium for its physiologic action in dilating the peripheral blood vessels and promoting perspiration, is a satisfactory method of reducing the temperature. Tepid sponging may be of benefit, and hot sooneing should be given the

patient daily if he is too ill for a hot bath.

If a testis is affected, the lesion is generally an orchitis, or epididymitis. Warm, moist applications often relieve pain; but if the testes are kept elevated and surrounded by absorbent cotton, and if some oil or fat, such as petrolatum, is applied, the inflammation will probably go away as rapidly as by any other treatment. Strapping is inadvisable in this complication. Massage, or rubbing in of any ointment or other preparation in this type of orchitis, or any similar treatment of the parotid glands, is inadvisable in mumps. The less these inflamed glands are manipulated the better. For postoperative parotitis, Arthur U. Desjardins (J. A. M. A., Feb. 7, 1931, p. 401) suggests irradiation therapy. In a case of aspermia, with bilateral testicular atrophy. following orchitis as a complication of mumps, spermatogenesis was produced by W. L. Brosius and R. L. Schaffer (J. A. M. A., Oct. 14, 1933, p. 1227) by injecting the gonad stimulating extract from the human urine of pregnancy. Aspermia returned on withdrawal of the treatment.

If the mammary gland becomes metastatically inflamed, the treatment is about the same as that for the parotid. If it is decided that the ovary is inflamed, little can be done, other than to insist on absolute rest and to administer a sedative. if there is pain. If there is much pain from any of these inflamed glands, morphine or codeine may be advisable, if it seems unwise to give a coal tar analgesic.

The period of isolation should be about ten days.

## EPIDEMIC MENINGITIS

This disease is known by many names, such as cerebrospinal meningitis, meningococcus meningitis and spotted fever. Herrick suggests the name meningococcus infection to cover all types and forms of this disease, which occurs in epidemic and sporadic forms. In the latter case it is often difficult to make a diagnosis. Young children and young adults are most often attacked. It occurs not infrequently in camps, or in other groups of closely associated persons. Probably most persons are immune, or at least are not very susceptible to this infection. The sporadic form is always more or less present in most cities. Epidemics appear, both in this country and in Europe. most frequently in the winter and spring months, and the greatest number of sporadic as well as epidemic cases occur during March, April and May.

W. W. Herrick (Arch. Int. Med., April 1919, p. 409) has described meningococcus sepsis without meningitis either evident clinically or at necropsy. This infection can also attack the joints and cause pleurisy, panophthalmits, endocarditis, pneumonia, orchitis and emphysema without meningeal symptoms. A petechial rash is usually present. These processes may be termed meningococcus sepsis, and it is probable that there is a wide dissemination of the oreanisms in the blood

stream.

The cause of epidemic cerebrospinal meningitis is Diplococcus intracellularis-meningitidis, also called meningcoccus, which was first described by Weichselbaum, in 1887. These cocci are found in the spinal fluid. It has been shown that a second lumbar puncture made a few hours after the first, or a drawing of the spinal fluid so as to get some of the fluid from the brain, more frequently yields the organisms than the first fluid coming from the puncture needle. This indicates again that the organisms may reach the brain directly from the nasal passages or throat before reaching the spinal cord. In appearance the organisms are

very much like gonococci, and lie in pairs either in or near the leukocytes. These germs are also found in the secretions of the nose and nasopharynx. The meningococcus is of low vitality and is readily killed by sunshine, drying and by freezing; therefore, with ordinary precautions the danger of contagion is slight. As in so many other diseases, carriers of this germ have been found, and they probably play a considerable part in the spread of epidemics and in the occurrence of sporadife cases.

Meningococcus cerebrospinal meningitis is a reportable disease, whether occurring in sporadic or in epidemic form, and carriers should be sought, and when

discovered, isolated and treated.

Rarely has the disease attacked an individual more than once. Carriers have become more or less immune, but even though close contact is needed for transmission of the disease, and though the germ is not sturdy and is readily killed after leaving the body, carriers must be isolated and treated. The persons who have been in contact with a case of meningeocoic meningitis should have the secretions of the nose and nasopharynx examined for this germ. It has not been determined just what local treatment of the nose and throat of these individuals is advisable, but antiseptic sprays, swabbings and gargles are indicated.

Neal and others believe that there is a brief invasion of the meningococcus into the blood in practically all cases of epidemic meningitis. The organism no doubt reaches the blood and meninges through the nuccous membrane of the nose and throat. An absolute diagnosis cannot be made until the germ has been recognized in a smear or cultured from the spinal fluid. In the septicenic form the zerm probably persists in the

blood for some time

It should be remembered that there is a septic type (spotted fever) of this disease. Though this type is rare, the early picture is that of a septicemia, although meningitis may develop later. In this type there is a purpuric rash; hence the name spotted fever. Neal and others describe a fulminating type of this disease, which fortunately is very rare but which has long been recognized. In this condition, the patient is seized with

severe headache and vomiting and soon loses consciousness; death may occur in from twenty-four to fortyeight hours.

Meningococcus meningitis must be differentiated from many other cerebral conditions, and the septic

type from many acute infections.

When the spinal fluid is cloudy and the symptoms are suggestive of meningitis, the assumption is that it is due to the meningococcus, and the antiserum should be injected even before the laboratory gives the bacteriologic report. The blood generally shows an increase in the leukocyte count, and a relative increase of the polymorphonuclear cells.

#### REFLEXES

The Babinski, Oppenheim and Gordon signs are significant of some harm to the corticospinal pathway. They may be present either early or late, depending on the degree of involvement of this pathway. They are usually associated with other signs of involvement of the corticospinal pathway; namely, increased tone, exaggeration of the deep reflexes and absence of the superficial reflexes. The signs are present when the corticospinal fibers are involved anywhere above the lumbar enlargement. In meningitis this involvement takes place at the base of the brain in the region of the cerebral peduncles. If an exudate is present there early, the signs will appear early; but no uniformity of involvement of the peduncles is to be expected in a disease such as cerebrospinal meningitis, in which the involvement of the central nervous system is never constantly in the same location.

# TREATMENT

If in a case of suspected meningococcus meningitis the fluid taken from the spinal canal is cloudy, antimeningitis serum, warmed to the body temperature, should be injected, and allowed to flow into the canal by gravity. The dose for an adult is from 20 to 40 cc., and for infants and children from 5 to 20 cc.; the amount depends largely on the quantity of fluid withdrawn. The dose should usually be from 5 to 10 cc. less than the amount of fluid withdrawn. In severe cases the antiserum is injected every twelve hours until there is serum is injected every twelve hours until there is

improvement. In moderate and mild cases the injection is repeated once a day for four days. The bacteriologic reaction of the fluid withdrawn at the last injection, and the condition of the patient, determine whether the antiserum should be given longer. Usually from four to six injections are necessary, but more are given if required. On successive punctures and injections the patient is turned first on one side and then on the other, which insures the emptying of the lateral ventricles in rotation. In other words, a patient who lies on his right side for one puncture will be placed on his left for the next. The frequency of the injections depends on the condition of the patient. In severe cases the serum may be given two or three times at eighteen hour intervals (Neal and others). In meningococcus sepsis intravenous serum therapy accompanying the intraspinal treatment is of marked benefit. Massive doses of antimeningococcus serum may be introduced in this way. The patient is desensitized by the injection of 1 cc. of serum subcutaneously. One hour later from 80 to 150 cc. of serum is given by vein, the first 15 cc. at the rate of 1 cc. per minute. The remainder is allowed to flow rapidly. In severe cases this dosage is repeated every eight to twelve hours and in mild cases every twenty-four hours until the symptoms subside. The intraspinal therapy is not to be neglected. Neal and others (Netter and Blackfan) do not believe that the serum should be given intravenously in children.

In some instances following injection of serum the patient may go immediately into a condition of shock, with shallow respiration, pallor and rapid, thready pulse. If a serum reaction occurs, the needle should be lowered immediately and the fluid allowed to flow from the canal. Artificial respiration should be resorted to if the breathing has ceased, and hypodernic medication should be given to stimulate the heart. Epinephrine may be given intramuscularly. This condition of shock rarely occurs with the smaller doses that are now administered. Increasing experience indicates the great desirability of early and frequent injections of the anti-meningococci serum in sufficient doses.

When the condition of the patient is such that intraspinal injection of serum cannot be made, Herrick

and others have suggested large intravenous injections, followed by drainage of the spinal fluid. Occasionally, in true meningococcic meningitis, no fluid, or only a small amount of purulent fluid, flows from the canal in spinal puncture-a condition of so-called dry tap. It has been thought that the spinal block is due to an exudate of such consistency as to prevent the flow of cerebrospinal fluid or to adhesions in the subarachnoid space. Stookey, Elliott and Teachenor, (J. A. M. A., July 12, 1930, p. 106) believe that the most frequent cause of spinal block as a complication of epidemie meningitis is swelling of the spinal cord. When there is blocking of the spinal canal and when little fluid can be obtained from a lumbar puncture, the spinal injection of serum is unsatisfactory. In such instances it has been deemed advisable by many clinicians not only to remove fluid from the ventricles if there is cerebral pressure, but also to inject the serum into the ventricles, as the meninges of the ventricles are always affected by this disease. Injection is made into the posterior horn of the lateral ventricle. Stookey and his co-workers suggest that 50 per cent dextrose solution be given intravenously in an attempt to reduce the edema of the cord. Cisternal puncture may be done in young children, especially when the spinal puncture is dry. Kennedy and Wortis (J. A. M. A., April 18, 1931, p. 1284) treat increased intracranial pressure by giving 50 per cent dextrose solution intravenously, rectal drip of dextrose or saline solution, 25 or 30 per cent, and caffeine sodiobenzoate in doses of 71/2 grains (0.5 Gm.) hypodermically or intravenously. They suggest keeping the head and trunk elevated at an angle of from 15 to 60 degrees from the horizontal position of the body. Also, serum injected into the cisterna reaches the ventricles and the subarachnoid spaces in the best concentration. The technic should be learned on a cadaver. Not infrequently a cause of death is excessive pressure from the fluid in the ventricles, an internal hydrocephalus, which is relieved by the withdrawal of fluid.

By putting a needle into the left ventricle, and another needle into the cisterna magna, and by injecting spinal fluid into the cisterna, under 80 mm. of mercury pressure, Lyon (J. A. M. A., July 12, 1930, p. 109) was able to overcome an obstruction in the aqueduct

of Sylvius.

Joseph J. Bunim and F. A. Wies (J. A. M. A., Jan. 21, 1933, p. 178) treated a case of meningococcus meningitis with antiserum which produced clinical improvement but did not sterilize the spinal fluid. After twenty-eight successive positive cultures, fresh, normal, human serum was administered intraspinally followed by additional antiserum, with immediate sterilization of the cerebrospinal fluid.

Cerebrospinal fever demands the best hygienic surroundings obtainable, and a quiet, cool, darkened room, as in any meningitis. The bowels should be thoroughly moved in the beginning, and then daily, or every other day. The patient should receive a laxative. If needed

Since the vomiting is reflex, stomach sedatives are of no avail. As the condition of the central nervous system is improved or the patient becomes more stuporous, the vomiting will cease. Food should not be pushed in the early stages as there is great repugnance to it. Plenty of water and later simple cereal gruels and milk should be the early diet. The subsequent diet should depend on the height of the fever and the ability of the patient to digest food. In the stage of convalescence food should be pushed, if it is well digested. Through the active illness, starches should be given to prevent acidemia. If the pan is sufficient to require sedatives, much food should not be given to prevent acidemia. If the pan is sufficient to require sedatives, much food should not be given, as it will not diesest well.

it will not digest well.

Pain is likely to be a most important symptom of this disease. There is no excuse for allowing a patient, even though a young child, to suffer pain. Morphine and codeine represent the most efficient and safe narcotics, the dose, of course, being regulated according to the age of the patient and the effect. Generally it is better to administer a very small dose hypodermically than a large dose by mouth; the action of the whole dose is obtained, and there is no doubt as to whether or not it is absorbed. Ergot given intramuscularly, not only seems to act as a sedative to the nervous system and possibly diminishes congestion, but certainly prolongs the action of the narcotic. Less morphine, codeine or other narcotic will be required to

stop pain and produce rest if ergot is given coincidently. Low blood pressure is another indication for the administration of ergot. Ordinarily, if the blood pressure is

high, ergot should not be given.

Local applications of cold with ice to the head and spine (the hair being cut short) may inhibit the inflammation, and sometimes seem to be of great value. At other times these cold applications increase the pain. This is especially true if the temperature is low. Exactly what these cold applications do to the blood vessels of the parts inflamed is a question that has not been determined. Cold sponging of the body is hardly advisable, as it tends to increase the internal congestion. Hot sponging, and even hot baths have been advised for very young children, to relieve the congestion of the central nervous system.

Painful joints may be wrapped in cotton and kept warm, as is done in rheumatism. Conjunctivitis should be treated with a boric acid wash. The throat and nose should be cleansed with saline sprays or mild

antisentic washes

There is no excuse for the administration of quinine, strychnine, calfeine, or any other cerebral stimulant. It would also seem inadvisable to administer alcohol in any form. If the blood pressure is high, hot sponging, small doses of glyceryl trinitrate and more brisk catharsis are indicated.

The patient should remain in bed at least a week after the cessation of the fever; convalescence should be prolonged, and the return to activity should be delayed. During convalescence it is well to administer small doses of sodium iodide, as iodine seems to aid the absorption of exudates. Iron and other tonics may be indicated.

Stiffening of the muscles and joints may require massage, and, if there are any adhesions in the joints, an orthopedist should be consulted as to whether passive movements or forcible breaking up of these adhe-

sions under an anesthetic is advisable.

Cerebral degenerations and disturbances, apparently caused by this disease, may develop after many years. The various complications that may occur have already been mentioned, and their treatment should be

that usual for the localized inflammation modified in view of the general condition of the patient due to the cerebrospinal fever.

## ACUTE ANTERIOR POLIOMYELITIS

#### DEFINITION

Flexner's criticism of the long-used names for this disease is justified, because the infection may be present and yet there may be no real inflammation of the cord justifying the names of anterior poliomyelitis or infantile paralysis. However, whatever the name, the condition is considered an infective, communicable disease that attacks the nose and throat, and causes the usual general symptoms of infection, not unlike influenza. It may, but by no means always does, cause an inflammation of the central nervous system, and frequently, but by no means always, causes paralysis. The paralysis is distinctive as being almost entirely motor. Nevertheless it has been shown that, contrary to previous belief, any part of the cerebrospinal system may be attacked by this disease; it is not confined to the motor tract of the spinal cord.

# EPIDEM IOLOGY

Although this disease is distinctly epidemic, it is also sporadic. It has occurred in this country in epidemic form for years, but has become more frequent since 1906, and many epidemics have been reported since that date. The largest and most fatal epidemic was the one of the summer of 1916, when 27,000 cases occurred in the United States, most of them in New York and the adjoining states. The California epidemic of 1934 affected between 1,000 and 2,000 cases.

Epidemic poliomyelitis seems to be self-limited, the disease dying out in a certain number of weeks. Epidemics are most frequent in the warm months, June, July, August and September, but just what causes the disease to stop has not been determined. Although cold weather is not apparently conducive to the growth of the germ of the disease, still sporadic cases may be seen in any month of the year. In New York City the epidemic of 1916 began in June, and practically ended in October. There is no question that the spread of the disease is stopped by proper quarantine.

Children under 5 years of age are most susceptible to the disease, but no age is exempt. About 10 per cent of the population is ordinarily composed of children under this age, but perhaps only an average of one in every hundred of these children acquire the disease in any one epidemic. In other words, a large number of all children, as well as most adults, are immune, or are not susceptible to this germ, or have the disorder in a mild unrecognized form.

In the 1916 epidemic in New York City 1.6 persons in every thousand of the population were attacked, as against 2.4 in the rural districts; and in New York City 80 per cent of those attacked were under five years of age (Matthias Nicoll Jr.: Am. J. Dis. Child.,

August 1917, p. 69).

Just what predisposes to a new epidemie has not as yet been determined. The disease is always sporadically with us. An anthroscopic study of 52 children paralyzed by anterior poliomyeltis during the epidemie of 1931, and 52 controls who lived in New York during the same epidemie, made by M. I. Levine et al. (J. A. M. A., Jan. 21, 1933, p. 160), brought forth no evidence of the relation of physical characteristics to susceptibility to anterior poliomyeltits.

Unhygienic surroundings do not precipitate or promote this infection. The most perfectly housed and cared for child may acquire the disease, while the most neglected, ill-conditioned and unwholesomely

housed child may escape it.

According to T. B. Quigley (J. A. M. A., March 10, 1934, p. 752) 14 cases of second attacks of acute polionyelitis are recorded in the literature, and he presents the fifteenth case, the first on record in which the second attack was fatal.

# FATALITY

The disease is most fatal in young infants, and is more fatal to boys than to girls. Epidemics show an average of a 10 per cent death rate, but the New York City epidemic of 1916 had a death rate of 27.2 in every hundred cases, i. e., more than one fourth of the patients died. Paralysis of the respiratory muscles or of the respiratory center is the most common cause

of death. About 25 per cent of patients in an average epidemic recover completely.

#### CONTAGION

The disease is transmitted by direct or indirect contact, and principally by contamination with the infected secretions of the nose, mouth and throat. Whether infection occurs by direct transmission of the infected mucus by kissing, or by eating or drinking out of common receptacles, or -by inhaing droplets which have been coughed or sneezed-into the atmosphere around a patient, or by inhaing infected dust, the fact remains that it is transmitted from person to Person. While the virus of the infection has been found in the feces, it is not known that it can live long in this environment. Secretions from inflamed eyes and ears of natients may transmit the disease.

Though the feet of flies or their mouths may carry the infection and plant it where contact can occur, neither they nor any other insect bave been shown to harbor this infection or to transmit it to man. No domestic animal has been shown to have or to suffer from this disease, although the paralytic symptoms of the distemper of dogs and horses have suggested

the possibility of a relationship.

To eradicate the disease, isolation, screening and strict quarantine of the patient are absolutely essential. The nurse must sterilize all clothing and utensits used by the patient. All nose, throat and bronchial secretions should be caught on gatuze, if possible, and burned. Fees and urine should be collected in antiseptic solutions, or the diagners should be boiled. The nurse should not come in close contact with others, especially children, and should not prepare food for any one other than herself and the patient. Though she may be immune, she may be a carrier; and we must recognize that this germ may be carried, as is the diphtheria germ, although the carrier may not have had the disease as far as is known.

In all epidemics a large number of unrecognized and "missed" cases undoubtedly occur, and account

in part for the spread of the disease.

Probably the most active period for transmission of infection is during the first week of the disease, but just how many days longer a patient could transmit the disease is not known; a quarantine of three weeks would seem to be protective to the community. A child or youth known to have been exposed to poliomyelitis should be isolated and under suspicion for two weeks.

The incubation period is from three or four days to two weeks; perhaps it is generally about one week. How long a carrier continues to be a carrier is not positively known. Swedish observers have championed the view that chronic carrying of the virus of poliomyelitis is common. However, painstaking critical and experimental studies by Flexner and Amoss of the Rockefeller Institute are not in accord with this conclusion. They claim that the virus is regularly present in the nasopharynx in cases of poliomyelitis in the first days of illness, and especially in fatal cases; that it diminishes relatively quickly as the disease progresses, except in rare instances; and that it is unusual for a carrier state to be developed. Hence the period of greatest infectivity of patients would appear to be early in the disease, which is probably the time at which communication of the virus from person to person takes place. Therefore, preventive measures should unquestionably be centered on the actual patients and particularly early in the disease. How frequently a cured patient becomes a carrier is not known. Theoretically a patient cured of an acute attack of this disease has developed enough antibodies to overcome the infective agent in the nose and throat as well as in the cerebrospinal canal.

The germ or virus is not killed by ordinary drying; hence dust may carry it.

The majority of adults and most children over 10 years of age, and a goodly number under 10 years of age, are immune to this disease. How generally this immunity is natural or inborn, and how often such immunity has been acquired by abortive, undiagnosed mild attacks of this disease, has not been determined. Recovered patients and inoculated and recovered monkeys have in their blood antibodies against this infection. The blood serum of normal adults shows such antibodies, though not of amount or of effectiveness equal to the blood serum of one who has had the disease, even many years before.

Late in 1934 Brodie of New York and Kolmer of Philadelphia developed means of inoculation against infantile paralysis using material from the brains of infected monkeys after treatment with antiseptic substances. These preparations seem to have the power to stimulate the development of immunity.

There has been much discussion as to the germ of this disease, but the only fact seems to be that a very interesting coccus has been found in the brain and spinal cord in patients that have died from poliomyelitis: however, its relation to the disease is not yet

determined

#### EARLY SYMPTOMS

The onset of the disease is usually sudden, without prodromal symptoms, with a more or less sharp rise of fever. The fever may or may not become high, but the pulse and respiration are likely to be much increased. Another constant symptom is pain, especially in the head and back of the neck, and there may be pain on movement of any part of the body. There is especially likely to be pain down the spine and in the legs; there may be some stiffening of the spine and the back of the neck. While the patient may be drowsy, the brain is likely to be clear. Instead of drowsiness there may be irritability. The pharynx and the tonsils are red. There may be spore some or even membrane on the tonsils. The eyes may be congested.

These symptoms occurring during an epidemic of poliomyelitis should cause this disease to be suspected, and spinal puncture should be made for a positive

diagnosis.

Though most patients are constipated, there may be symptoms occurring in an epidemic of poliomyelitis, with an unusual amount of muscle, back, and head pains, should also suggest this disease, and the spinal

fluid should be examined.

In many instances, the fever of the first day or two is followed by a remission, and then a second attack of fever occurs, and later paralysis; or paralysis may occur on the first day, depending on the amount of cerebrospinal inflammation. An older patient may complain of dizziness. There may be diminished patellar reflexes, although at first they are likely to be

increased. There may be bladder paresis and retention. There may be hyperesthesis and vasomotor disturbances, as flushing and blanching of the skin of different parts of the body. Herpetic eruptions are not infrequent. Kernig's sign is often present. Profuse sweating may occur, and there may be eruptions on the skin of varying types, mostly erythematous. These vasomotor disturbances may also occur in the mucous membranes of the nose and throat, causing them to

The fever usually lasts only a few days, but it may persist for as long as two weeks. There does not seem to be any characteristic range of temperature in this disease. The intensity of the beginning symptoms seems to be no indication of future severity or of future paralysis. An attack with mild early symptoms may be followed by serious paralysis and a dangerous condition.

condition

Not only is flexion of the head sometimes combated by the patient on account of the pain, but also flexion of the spine often causes pain, a symptom of diagnostic importance.

# DIAGNOSIS

The most frequent early symptoms described, especially if an epidemic is in progress, should suggest the possibility of poliomyelitis. If there is stiffening of the back of the neck and pain on bending the spine, the presumptive diagnosis is poliomyelitis, and should lead to immediate lumbar puncture for a positive diagnosis. Careful examination of the extremities may show, even in a young child, a slight difference in the movement of the arms or legs, and such beginning paralysis may occur early in the disease. However, it should be noted that many patients with this infection may not show paralysis, muscular weakness or stiffening of the muscles early in the disease. Also, the temperature may drop in a day or two, to rise again later. Consequently, it should be urged that a patient with the symptoms described, even without positive diagnostic symptoms, either should have lumbar puncture made to clear up the diagnosis or should be under suspicion for a week or ten days. If poliomyelitis is suspected, though the symptoms are indefinite and lumbar puncture is not allowed, the patient should be isolated for two weeks.

It may be briefly noted that symptoms of cerebrospinal fever are similar in the beginning to those of poliomyelitis, with perhaps more tendency to vomiting and generally with an eruption. Early in the disease there is more stiffening of the neck and less pain in the lower part of the back and in the legs. Tuberculous meningitis is never as rapid in its onset as either of the above infections.

As in other diseases, the greatest difficulty in making a diagnosis in poliomyelitis is to make it early in its course. M. B. Brahdy and M. L. Lenarsky (J. A. M. A., April 28, 1934, p. 1358) state that during the period of systemic invasion, the greatest problem is presented by mild infections of the upper respiratory tract and gastro-intestinal upsets. When poliomyelitis progresses beyond the first stage, the infectious process localizes in the central nervous system and causes signs of meningeal irritation. There are many diseases of childhood, unrelated to disorders of the nervous system which may be associated with meningeal irritation. For this reason, a careful history and physical examination are of great importance. A stiff neck may be associated with an inflamed middle ear, pneumonia, severe pharvngitis, tonsillitis or persistent diarrhea. The spinal fluid during the second stage of poliomyelitis may show some abnormalities and usually does, but it may be normal. Further advance of the infectious process in poliomyelitis produces signs of paralysis or encephalitis. Paralysis may be simulated by abnormal conditions in the muscles, bones or joints. Age is an important factor in making the diagnosis of poliomyelitis in the paralytic stage. Cerebral hemorrhage and arteriosclerosis are not uncommon in persons over 50 years of age, whereas poliomyelitis is rare in that period of life.

#### LUMBAR PUNCTURE

When a lumbar puncture is made for diagnostic purposes it should be remembered that normal spinal fluid contains not more than 10 cells per cubic millimeter, and in poliomyelitis the number is increased to 20, and at times to even 1,000 or rarely 2,000.

Rührah (Am. J. M. Sc., February 1917, p. 178) notes that in the early stage of the disease the polymorphonuclear cells are found increased, while after paralysis has occurred the chief growth is in the lymphocytes. He states that this increase in the number of cells in the spinal fluid disappears in about two weeks.

If the fluid withdrawn is clear, the mononuclear cells will predominate; if it is opalescent, as it occasionally is, the polymorphonuclear cells are increased. A pleocytosis consisting of 50 per cent or more multilobed cells, occurring in a clear fluid, is suggestive of acute poliomyelitic infection. When, in the course of from twenty-four to thirty-six hours or so, the lumbar puncture is repeated and there is a fall in the total cell count with a shifting of the differential count to a mononucleosis of 90 per cent or more, one may be certain that the condition is one of poliomyelitic infection. This cellular response is pathognomonic, as it has not been observed in the spinal fluid in other conditions.

Of course, if there is an increase of fluid in the cerebrospinal canal there is more pressure, and the amount of pressure is indicated by the speed with which the fluid is discharged at the time of puncture. The quantity of fluid obtained varies from 10 to 50 cc. The cerebrospinal fluid pressure is often increased by muscular tension, by pain, and by uncomfortable positions. Hence, the symptoms of pressure are relieved by muscle and nerve rest.

Pain in the majority of cases is relieved by lumbar puncture. Also many head symptoms are relieved by the evacuation of fluid which is under pressure Consequently, lumbar puncture is a therapeutic mea-

sure of distinct value.

Charles Dana (J. A. M. A., April 7, 1917, p. 1017) describes a condition that not infrequently occurs. namely, what may be termed "puncture headache." This rarely begins until the day after the fluid has been removed from the spinal canal. It is not serious, and does not last long, but may be quite severe. The pain is diffused over the head and even over the eyebrows, or it may be mostly occipital. Dana finds that this pain, with various remissions, may last from five to ten days, or even longer. He also finds that it is more likely to occur when there is a small amount of fluid in the spinal canal, and hence low pressure, than when there is high pressure, with extra fluid in the canal. This, of course, is logical, especially as he interprets the condition to be due to the fluid removed from the spinal canal, allowing the water pad of the brain to be diminished so that the brain temporarily rest on the cranial bones and thus causes headache. Therefore, to prevent this "puncture headache," he would withdraw the fluid very slowly and keep the patient horizontal for three or more days.

Besides an increase in the number of cells, the globulin content is increased, and the presence of dextrose is demonstrated by the reduction of Fehling's solution. Mild and even abortive cases may show the same spinal fluid changes. "The blood in the preparalytic stage does not show a total leukocytic count in excess of what might be considered normal, but as the infection progresses, there is a constant and marked leukocytosis, with an increase of 10 to 15 per cent of polymorphonuclears, and a decrease of 15 to 20 per cent of lymphocytes." Meningism, syphilis and either tuberculosis or purulent meningins may be confused with the early stages of notionwelitis.

That the virus of poliomyelitis travels along the never trunks as does the virus of hydrophobia is one view, which seems to be supported by experiment. It is also believed that the disease spreads through the lymphatics.

#### PARALYSIS

As previously stated, when flexing the head and bending the body—in other words, when movements of the spine and consequent irritation of the spinal cord—cause pain, poliomyelitis is frequently the cause. However, without these symptoms paralysis may develop at any time, from twelve hours to many days, and Ruhräh states that paralysis may occur as late as twelve days after the onset of the disease.

It should again be emphasized that the severity of the beginning symptoms seems to bear no relation to the amount of paralysis that may follow; severe onsets may not be followed by paralysis; mild ones may be followed by multiple paralysis and death. Severe abdominal pain may occur, even simulating conditions that call for operation. There may be tremblings or tremors of one or more extremities, especially on the attempt to move these parts.

The parts most frequently paralyzed are the legs, either one or both. LeBoutillier (Am. J. M. Sc., February 1917, p. 188) found that in 25 per cent of all cases one or both legs are involved, in 12 per cent one or both arms. In the severest cases the muscles of the trunk are involved, even those of the neck, and death occurs from failure of respiration. The muscles most frequently paralyzed, in the order of frequency, according to Ebright (J. A. M. A., Sept. 1, 1917, p. 694), are the "anterior foot muscles, quadriceps, glutei, hamstrings, deltoids, hip flexors, internal rotators of the thigh, and external rotators of the shoulder." He also declares that "a stretched muscle will not regain its tone."

Some statistics from the New York epidemic showed that two thirds of the patients had paralysis that lasted longer than the quarantine, while about 15 per cent never had paralysis, and about 15 per cent more

had short-lived paralysis.

### EARLY TREATMENT

The early treatment should take into consideration the prevention of the infection of others, even before the diagnosis has been positively made. In other the diagnosis has been positively made. In other screened, all discharges dissinfected, and all clothing sterilized. Of course, as soon as the diagnosis is made the case should be reported, and all children who have been in contact with the patient should be isolated for two weeks.

It should be recognized that the nurse or other attendants may carry the infection in their nostrils or throats and yet not suffer from the disease. They may have become immune from previous attacks, or they may have a natural immunity, and still harbor the infection. The dust of a room in which a patient with the disease has been may carry the infection, and it is even stated that the streets and sidewalks may harbor it; hence the spread of epidemics. Bathing in pools of water, or in tanks where the water is not frequently changed, should be problited during

an epidemic. While it has not been shown that domestic animals harbor the infection, pet animals, as cats and dogs, might carry the infection in their fur.

Hydrogen dioxide may be used in 5 per cent solution in warm water as a spray (two or three times a day) into the nostrils of all children who may have been exposed to the disease. Also the nostrils of the attendants of the patients should be so treated. The throats of young children should be sprayed, while older children should gargle with a little stronger solution of hydrogen dioxide, as 10 or 15 per cent. Three or four minutes after the hydrogen dioxide solution has been used, the parts should be sprayed or washed with a weak (not more than 1 per cent) solution of sodium chloride and sodium bicarbonate in warm water.

The treatment of the preparalytic stage is the same as that of any other infection. The bowle should be thoroughly evacuated with the purgative which seems most advisable. Food should be entirely stopped for twenty-four hours, and only water given or at least only some simple cereal gruel, or milk. The patient should be absolutely at rest, without mental or physical disturbance. The body should be gently cleansed with hot or warm water sponging, the temperature depending on the amount of the fever. Cold water sponging is inadvisable. If there is much pain the patient should be very gently handled, to cause the least possible muscle movement. It may even be necessary, temporarily, to bandon sponging.

Acute pain must be stopped with small doses of codeine or of the tincture of opium. The beginning dose may be small; the subsequent ones should be sufficient to render the child nearly free from pain and to produce some sleep. The lumbar puncture that should be done for diagnostic purposes often becomes a therapeutic measure of value, relieving the symptoms of pressure and stopping pain. Puncture for therapeutic purposes may be done every day for several days, and more frequently, if symptoms of increased pressure are present.

By the second or third day the nutrition of the patient should be carefully watched; the character and the amount of the food depend on the height of the temperature and on the ability of the stomach to digest. Some nutrition every three hours in the daytime and once or twice in the night is the best method. If it is not advisable to give meat broths or meat extracts, the child should receive small doses of iron almost from the beginning of the illness. One of the best methods of administering iron is a powdered tablet of the saccharated oxide of iron. A 3 grain tablet once a day is sufficient.

If there is much restlessness and sleeplessness without acute pain, small doses of bromide may quiet the child, stop the pain and cause sleep. Coal tar products and synthetic drugs, although they are more or less analgesic, should not be given these young children. Their depressant action is uncertain. Even phenyl salicylate is probably inadvisable. Calcium lactate, in doses of from 0.15 to 0.40 Gm. (depending on age of the patient), every six hours, may help to quiet any irritation of the parathyroid glands.

Other drugs are not advisable unless directed toward

the relief of definite symptoms.

Acute pain and active symptoms may disappear in from a few days to two weeks after the paralysis. Until pain has ceased, all active measures aimed to overcome the paralysis are contraindicated. The treatment of the paralyse are contraindicated. The treatment of the paralyzed parts should be to put them in the most comfortable position possible aided by cushions, sandbags or branbags, or by the use of a water bath, so that stretching of paralyzed muscles and ligaments may not occur, and overaction of nonparalyzed muscles be limited. Sometimes muscle spasm with pain is relieved by a warm water bag. Very hot water bags should not be used on the child's skin unless they are so covered that the heat is modified. Painful joints may be wraponed in cotton.

During convalescence the nutrition should continue to be of the best. Fresh air is important, but rest and quiet for the patient should be continued. Small dose of iron should be given, and some simple bitter tonic may be administered, if the appetite is poor. Calcium in some form may be advisable, unless considerable milk is given the patient.

When the tenderness is diminishing from the second to the fourth week, Lovett advises immersing the patient in a hot saline bath and allowing him to move the joints a little and change his position. Tenderness is also diminished by daily gentle heating of the affected areas with electric light.

#### SERUM TREATMENT

The injection of a serum from a person who had had poliomyelitis is more or less inhibitive to the advance of this disease and seems to stimulate the production of antibodies in the individual to fight the disease. It is advisable to obtain such blood serum, if possible, and to inject it, best intraspinally, and possibly later intravenously, into the patient. It has been reported to be more valuable when given in the early stages, as is true in the antitosic treatment of all diseases. The serum should generally be given intraspinally, and perhaps only intravenously when there are signs of a general infection or when complications have occurred. It may be given daily, or every two or three days for several doses, and the amount suggested has been from 5 to 40 cc.

The pressure under which the fluid is given should be very carefully watched, and if pressure symptoms occur, the injection should immediately cease, and if necessary some of the fluid must be allowed to flow out of the canal. It may be administered at the time that for therapeutic or diagnostic reasons fluid from

the spinal canal has been withdrawn.

On account of disturbing symptoms and the danger of increased pressure, Draper (J. A. M. A., April 21, 1917, p. 1153) cautions that not more than 10 cc. should be injected into the spinal canal, and then only when a larger amount of spinal fluid has been removed. In other words, increased pressure in the spinal canal must be avoided. He believes, however, that immune serum, when it can be obtained, should be given to every child, and the earlier the better, as it seems to have been shown to be of the greatest value before paralysis has occurred. Moreover, until we have more positive data, the serum should be given, during the progress of the disease, even if paralysis has occurred, as it may

It is hardly necessary to urge the necessity of a careful selection of the donor for this serum. The

more recently he has recovered from poliomyelitis, the more active in antibodies must his serum be. However, he may have had the disease many years before and the serum still be of value as a therapeutic agent. Of course, he should have no chronic disease, Syphilis must be excluded by a Wassermann or Kahn test. unless the history of the patient and his family is absolutely known. The laboratory care and preparation of the serum for use is beyond the province of this review.

Shaughnessy, Harmon and Gordon (Proc. Soc. Exper. Biol. & Med., May 1930, p. 742) concluded from their experiments that serums of family contacts and of normal adults and older children possess greater power to neutralize poliomyelitis virus than the serums of persons who have recovered from an attack of the disease.

Faber (J. A. M. A., March 21, 1931, p. 935) maintains that it is advisable to test for viricidal properties those samples of human serum intended for the treatment of poliomyelitis. Pooled serums may have low or inadequate amounts of immune antibodies owing to the inclusion of nonimmune serums and consequent dilution of the immune fractions. The tests are expensive but practicable. He suggests also the possibility of using large amounts of immune blood by direct transfusion in severe cases as a means of obtaining prompter and more thorough therapeutic action than is afforded by intramuscular or intrathecal injection.

Neustaedter (J. A. M. A., March 21, 1931, p. 933) found marked success with the use of antipoliomyelitis horse serum in more than 60 cases of frankly paralytic cases. The earlier the serum is given, the better the results. The dose employed is from 20 to 30 cc. every twenty-four hours, intramuscularly or intravenously.

Convalescent poliomyelitis serum is now available to the profession in different parts of the United States through the establishment of convalescent serum centers, either by boards of health or through private endowment. These centers, however, do not furnish a complete service throughout the entire country,

The opinion of investigators is divided as to the value of convalescent poliomyelitis serum in the treatment of patients with this disease. It is generally agreed that whatever value it might have is greatest when the serum is administered in the preparalytic stage. Some investigators believe that, once the stage of paralysis has been reached, no benefit results from the use of serum. Other investigators, on the basis of clinical observation, believe that any individual still in the active febrile stage of poliomyelitis should be given the benefit of convalescent serum treatment. It is believed, therefore, by some that the convalescent serum may inhibit or prevent the progress of the disease; but paralysis that has resulted from destruction of nerve cells, of course, cannot be relieved.

The blood is withdrawn under sterile precautions by means of a special apparatus into a centrifuge flask. The flask has a two-hole stopper with glass and rubber tubes attached, such as is usually used for collecting fluids asentically. After coagulation the serum is drawn off and centrifugated. Wassermann and sterility tests are performed on the serum. The amount drawn varies with the age, size and condition of the donor and may be from 150 to 400 cc. Tricresol is used as a preservative; equal parts of ether and tricresol are added so that there is a final concentration of 0.2 per cent tricresol, or 0.4 per cent of the mixture of ether and tricresol. It is generally agreed that the potency of the serum is not appreciably diminished over a period of one year, when kept at 4 C. There is a variance of opinion as to dosage, but it is generally agreed that the first dose in a case is 20 cc. of serum intraspinally and 60 cc. intravenously, and, if a second or third administration is necessary, each dose is 20 cc. intraspinally. Additional treatment depends on the course and progress of the case.

# COMPLICATIONS

Each part affected must be treated in the best way possible, as it would be treated were this disease not its cause. A lung complication is very serious, as the danger is great from anything that interferes with the respiration.

In respiratory paralysis the use of the Drinker, Emerson or other respirator may be life-saving. A number of cases of recovery following respiratory paralysis by the use of this apparatus have been reported. It consists of an air-tight tank connected to an electrical slow-speed blower. The patient's body lies within the tank and alternate positive and negative pressure is produced by means of the blower, which thus sucks air into the patient's lungs and blows it out.

Any case of poliomyelitis, with or without a rise in temperature may develop respiratory paralysis within twenty-four hours, according to Emil Smith (J. A. M. A., May 27, 1933, p. 1666). The most important indication for placing a patient in the respirator is a diminished vital capacity. As soon as this indication is apparent there is nothing to be gained by waiting for a fully established picture of respiratory muscle paralysis. The only indication for removal of the patient from the respirator is the ability to cough. Patients removed from the respirator without being able to cough may later develop atelectasis with bronchopneumonia.

Secretions and exudates from any complicating inflammation should be thoroughly sterilized, as they may carry the germ or virus of infection.

### CONVALESCENCE

There is a difference of opinion as to whether a paralyzed patient should be kept at rest in bed for a long time or should be allowed soon to begin to walk, There can be no doubt that anything that tends to fatigue is seriously injurious to the paralyzed muscles, and, also, that anything that causes overactivity of the nonparalyzed muscles is not desired.

It would seem, therefore, that each patient should be individualized as to the length of time he should remain flat in bed, with such passive movements and such gentle massage as seems advisable. Pemberton (J. A. M. A., June 21, 1930, p. 1997) recommends the use of massage as soon as the acute stage of the disease has passed, as manifested by the disappearance of pain. This should consist, at first, of only superficial stroking. If the pain reappears, massage should be stopped. The massage should always be preceded by heat and followed by muscle training. Overuse of massage increases muscular atrophy and diminishes muscular tone. As soon as improvement occurs the patient should probably begin to be about, with such

protective apparatus as will prevent deformities and still allow locomotion, and at the same time be not so

massive and weighty as to cause fatigue.

From the start, voluntary movements of paralyzed limbs and groups of muscles should be urged, and after long months, and even years, of paralysis such voluntary attempts should be made, as they sometimes result in wonderful improvement. Resistant massage, if the child is old enough to cooperate, is advisable, but the results must be carefully watched and fatigue prevented.

Hydrotherapy, that is, attempts to move paralyzed muscles, made while the patient is in a water bath, is recommended, but such treatment must be carried out

under skilled supervision.

Gentle faradism or the sinusoidal current, and gentle galvanism, of just sufficient strength to cause contraction of the muscles, is probably soon advisable; but electricity should not be used more than five to ten minutes in any one day. Some clinicians believe that electricity is worthless (especially Lovett, J. A. M. A., May Z., 1922, p. 1607), but the majority of opinion is that, when properly used, it is of value in awakening the activity of muscles and nerves. However, artificial contractions are never as beneficial as are even slight voluntary contractions.

Before electricity is applied the part should be heated with warm applications and gentle massage, as the circulation is always sluggish in a paralyzed area and the part is always colder than normal portions of the body. This massage, by stimulating the circulation of both blood and lymphatics, allows the electrical reaction to occur with less strength of current. Electric light heat, as suggested by Lovett, is a valuable method of heating a chilled, paralyzed limb. Mild

diathermy is of value.

Lovett, who studied this disease thoroughly, said that it is not generally recognized that the muscles of the back and abdomen become weakened in this disease, causing many deformities, especially if the child sits too long. Deformities in these cases should be prevented by proper jackets or corsets. He especially cautioned against the use of the legs with too heavy apparatus on them in the first year following the disease.

Skilled muscle training and the advice of an orthopedic surgeon are essential in the management of these paralyzed children, even in the convalescent stage. Drop foot or eversion or inversion must be prevented, if possible. Rotation or deformity of the knees must be noted and prevented. A group of muscles may not be actually paralyzed, but exercise of these muscless may show an unusual tiring of one arm or leg as compared with the other, and such an extremity needs watchful care and treatment.

Finally, in this stage of convalescence it should be urged that all massage, applications of electricity, and exercise should be done by skilled hands and with skilled advice. The paralyzed limbs, and perhaps the whole body, should be kept extra warm by proper clothing, depending on the age of the patient, the season of the year, and the climate. Chilled limbs do not recover as well as limbs that are kept thoroughly warmed.

John Rührah (J. A. M. A., May 20, 1933, p. 1587) insists that deformity in poliomyelitis may be prevented, but a start in doing so must be made as soon as possible. The patient should be placed on a firm mattress with boards set transversely under it if necessary. Pilowseshould not be used under the legs. The patient should be kept recumbent in a suitable splint which will help relieve the acute pain so often present at the onset.

Relaxation and rest are the most important factors in the treatment. Fatigue both general and local must

be guarded against.

The muscles must be protected. A muscle will recover its power more quickly and completely in complete relaxation than in any other position.

Proper splinting and the daily bath, at which time proper passive exercises may be undertaken, will pre-

vent contractures.

At first the more important muscles should be favored until their recovery is assured. These are the deltoids, the extensors of the wrists, the opponens of the thumb, the glutei, the quadriceps, the calf muscles, the invertors of the foot and the abdominal muscles.

Muscles may be re-educated and strengthened by suitable exercise. If a movement cannot be made voluntarily it should be made passively, and the patient encouraged to will it. A muscle should never be permitted to become fatigued. The exercise given must always be well within the capacity of the muscles. When muscles of the trunk and legs are involved, weight bearing should not be allowed while improvement is going on, if the aim is to achieve all the recovery possible, but only after it has come to a standstill. Warmth is useful. The muscles should be warmed

Warmth is useful. The muscles should be warmed before exercise. The morale of the patient should be

kept up.

# PROGNOSIS

The early prognosis as to fatality should be very carefully made, even in mild cases, up to the latter part of the first week. The actual death rate varies greatly in different epidemics, perhaps roughly from

10 to 20 per cent, or even higher.

While a few patients do not have paralysis, many of these will be found to have weakening of some muscles. From such weakening of muscles and actual paralysis there may be rapid recovery, even in a few days, but most paralyzed patients will not recover for several weeks or even months, while perhaps the majority of those who have suffered paralysis will never again have perfect muscle power. Some patients may recover without scientific orthopedic or other medical treatment, but the possibility of such recoveries without deformity should not be depended on. There can be no question that scientific, careful management of the paralyzed patient and of each paralyzed limb many cause progressive and continued improvement for months and even years, while any mismanagement, as overexertion, faisque or misdirected and oversued measures for improvement will certainly retard recovery or even prevent it.

As previously stated, respiratory paralysis is a most common cause of death, and respirators of the Drinker type should be on hand, since they will prolong and save life. It has been suggested that turning the patient from side to side may prevent dangerous edema

in the vital nervous tissues.

It should be remembered that during apparent improvement in this disease serious relapses may occur. When the disease attacks an adult it seems to be more serious, and the prognosis is not so good.

### LATE TREATMENT

Orthopedic advice should be sought early in the disease, as soon as paralysis occurs, or at least the best orthopedic measures should be taken to prevent deformities. During the stage of convalescence is the period when the orthopedist should either take charge of the patient or be consulted frequently enough to insure the best possible management of the paralyzed child. The great necessity for rest and yet graded stimulation of weakened muscles has already been emphasized. Proper care at this stage prevents deformities that would necessitate surgical correction later. It cannot be repeated too often that voluntary effort is of the greatest possible value in awakening paralyzed muscles and groups of muscles.

It has been shown that a muscle that is overstretched by a malposition of a limb or part of a limb cannot recover its vitality and strength. Hence such stretched muscles must be relaxed by proper splints or appliances. Although, as previously stated, electrical stimulation is not considered of value by some clinicians, it is urged by others that if a muscle responds to gentle faradism, such daily gentle treatments continued only a few minutes at a time will

hasten recovery of the muscle.

Improvement may go on for two years, and if a muscle shows only a slight trace of power there is still hope, even after several years of paralysis. Lowest emphasized the danger from unnecessary braces, and the danger from not properly supporting the parayzed muscles. He especially urged that support be given to weak abdominal and weak back muscles. In other words, it requires the best of judgment to decide just what sort of spinal, or other supports, should be used.

A. T. Legg (J. A. M. A., March 4, 1933, p. 647) suggests the use of the artificial respirator as an exerciser after its use to maintain life is no longer needed. The increased aeration of the lungs and the deeper movement of the diaphragm in the abdominal cavity resulting from the use of the respirator should be an aid to the general health of the pathent in addition to its value in preventing deformities of the chest and in aiding the return of power to the muscles of respiration.

If a deformity persists after two years or more, surgical orthopedic measures may be instituted, such as the cutting of tendons or fasciae or the stretching of muscles, or more radical measures may be instituted

in the way of bone and nerve surgery.

When a brace is placed on a child, the mother should thoroughly understand that this is only for the prevention of deformity and that it is not a cure for the paralysis, and the child should either be treated at home or taken to some institution for continued muscle treatment. Such treatment may be artificial heat, as by electric light; massage; electricity; voluntary or resistant exercise; and later, graded exercises sometimes termed educational exercises, to reductate a muscle or group of muscles to do its or their proper work.

### EPIDEMIC LETHARGIC ENCEPHALITIS

For nearly twenty years there have been outbreaks in various parts of the world of an extraordinary acute infection of the central nervous system, different from poliomyelitis and meningitis. These cases have differed in seasonal incidence, in age distribution and in clinical manifestations. They have been described as encephalitis or encephalomyelitis. In addition, there has been an increase in the number of cases of encephalitis reported following measles, and other infections, as well as after vaccination.

Historical accounts indicate, according to Josephine B. Neal (J. A. M. A., Sept. 8, 1934, p. 726) that encephalitis is by no means a new disease. Doubtless, outbreaks have occurred through the centuries. It appeared in epidemic form in Austria in the winter of 1916, in France and Great Britain in the winter of 1917, and in America in the winter of 1918. Japan suffered an outbreak in 1924, and again in 1929, and the most recent American epidemics were those in St. Louis during 1933, preceded by an outbreak in Paris, Illinois, in 1932, and followed by another in southern Illinois in 1934.

In recent years, encephalitis, like poliomyelitis, has been always present, and at every season in communities of large size. According to J. P. Leake et al. (J. A. M. A., Sept. 8, 1934, p. 728), a survey of the

more important cities of the United States reveals that many of the cases currently being reported as epidemic or lethargic encephalitis lack the characteristics either of the disease as seen in St. Louis in 1933 or of the disease as originally called lethargic encephalitis by yon Economo.

# ETIOLOGY

Epidemic encephalitis is probably produced by a filtrable virus. Evidence of direct contagion does not exist. Infection probably takes place through the nasal mucous membrane.

No age is immune from encephalitis, but the disease is rare in young children. The incubation period is uncertain.

A number of strains of a virus that seemed to be the etiologic agent of the 1933 epidemic of encephalitis were isolated in two different laboratories. This virus acted on monkeys and white mice and is distinct from other previously known viruses. Following intracranial inoculation in the monkey, after an incubation period of eight to fourteen days, fever, tremor and other symptoms developed. In mice the incubation period was from four to eight days.

# SYMPTOMS AND DIAGNOSIS

Epidemic encephalitis was originally recognized by the syndrome of fever, lethargy, and double vision. These cardinal symptoms still occur in many cases at some time in the course of the disease. The onset may be insidious or acute, the former being more common. The St. Louis cases in 1933 were characterized by a rather sudden onset, with headache, high fever, stiff neck, mental confusion, tremors and other neurologic symptoms, but only occasional, transient ocular manifestations. Following a stormy course, in most instances rapid improvement occurred leading to apparently complete recovery within two or three weeks and leaving no residual effects.

There were apparently two distinct phases to the infection with symptoms first of a systemic nature, such as lassitude, malaise, griplike and abdominal pains and nausea and voniting, and then a second phase with symptoms indicating invasion of the central nervous

system. This produced fever, headache, stiff neck, mental confusion and tremors with a host of irregular neurologic signs and symptoms, depending on the

localization of the pathologic lesions.

On physical examination, says Theodore Hempelmann (I. A. M. A. Sept., 8, 1934, p. 733), the commonest objective sign was rigidity of the neck or spine, and perhaps next in frequency was arisabsence of the abdominal reflexes, the latter vanishing early in the disease and returning with convalescence. In the majority of instances the Kernig sign was positive at some time during the course of the illness.

Examination of the blood as a rule revealed a moderate degree of leukocytosis, usually between 12.000 and

20,000, but exceptions to this may be observed.

In encephalitis, the spinal fluid is clear, under slightly or moderately increased pressure, with an increase of cells, most of which are of the mononuclear variety. The average cell count is between 50 and 250 cells. The spinal fluid sugar is normal or slightly elevated and the globulin only-moderately increased.

#### DIFFERENTIAL DIAGNOSIS

During the period of invasion, before neurologic signs develop, the illness may be confused with influenza. Cases presenting chills, fever and without leuko-cytosis may suggest the possibility of malaria. Typhoid is closely simulated at times especially when the patient has a leukopenia and bradycardia. Encephalitis and tuberculous meningitis may at times be indistinguishable in the early stages. Acute anetroir poliomyelitis may exhibit symptoms and spinal fluid changes similar to encephalitis, but in poliomyelitis the sensorium is clear, speech is unaffected, and blurred vision, vertigo and pathologic plantar reflexes are rare.

### PATHOLOGY

The essential pathologic process in the St. Louis type of encephalitis as found by H. A. McCordock et al. (J. A. M. A., Sept. 15, 1934, p. 822) was a nonsuppurative inflammation of the nervous system characterized by intense vascular congestion, cellular infiltration, and degenerative changes in the nerve cells.

#### PROGNOSIS

A good prognosis can never be given in encephalitis owing to the severe sequelae following mild attacks and at long intervals. It has been stated that 25 per cent die, 25 per cent recover completely and 50 per cent have various residual complications, of which at least 25 per cent exhibit Parkinsonism.

In the St. Louis epidemic, increasing age influenced prognosis more than any other single factor, states Andrew B. Jones (J. A. M. A., Sept. 15, 1934, p. 825). The presence of pre-existing organic diseases such as nephritis, heart disease or debilitated conditions greatly increases the chances for a fatal termination.

# RESIDUAL AND LATE MANIFESTATIONS

The Parkinsonian syndrome develops most frequently six to twelve months after the initial attack of encephalitis. There is the Parkinsonian mask, variable muscular rigidity, and slight tremor. Mental changes are common when the Parkinsonism is marked.

Changes in mentality occur in many cases. There may be lack of power of concentration, drowsiness, insomnia and in children excitement and moral changes.

### TREATMENT

There is no specific treatment for encephalitis, so that the disorder is treated symptomatically. According to J. W. Eschenbrenner (*I. A. M. A.*), Sept. 15, 1934, p. 826), good specialized nursing care is important. The patient should be given complete bed rest, a soft diet and forced fluids.

Since in the acute stage of the disease, the symptoms are due to increased intraranial pressure and cerebral edema, treatment should be instituted to relieve this condition. This should include spinal puncture and intravenous injection of hypertonic dextrose solution. The spinal puncture which is usually performed for diagnosis will usually be sufficient for relieving pressure. In cases where there are more marked signs of meningeal irritation or further symptoms of increased pressure as second puncture may be performed.

The hypertonic dextrose solution should be given intravenously as a ten per cent solution; 50 cc. should

be given for the adult and correspondingly smaller doses for children. This amount may be given daily

until the severe part of the disease is past.

In the more stuporous patients it may be necessary to resort to the use of a nasal tube for feedings. In the dehydrated patients, saline solution should be given subcutaneously. Hyperpoyersia, which is present in many cases may be successfully treated with hydrotherapy, such as tepid sponge baths, alcohol rubs and cice bags to the head. The ice bags also help relieve the heedacht.

When muscular rigidity is a prominent symptom it may be treated with atropine, scopalamine or stramonium. If atropine in full doses fails to give relief, the powdered leaves of stramonium may be given in cansules, beginning with doses of 0.13 Gm. (2 grains)

and gradually increasing.

In the St. Louis epidemic, convalescent serum was found to be of little value. The use of convalescent serum, prophylactically, is not indicated because of the paucity of more than one case of encephalitis in a family.

Parkinsonism may be treated with phenobarbital, which may be continued in fairly large doses.

#### TYPHOID

#### CENERAL PROPHYLAXIS OF TYPHOID

Typhoid is one of the most preventable of all infectious diseases; it is being almost completely eradicated from most cities, except as visitors may import the infection. This protection is produced by a pure water, milk and ice supply, and by the prohibition of the selling and consuming of oysters fattened in water polluted by feces or of clams dug from mud or sand bathed by such polluted water. In 1930, the total mortality rate for seventy-eight large cities for which records are available since 1910 was 1.61 as compared with 1.59 in 1929. In 1933, the rate was 1.18.

Oysters become readily infected by water containing typhoid or paratyphoid bacilli. These bacilli are found to live at ordinary chilling temperature for twenty-two days in shucked oysters, and for sixty days in shell owsters (J. A. M. A., May 9, 1925, p. 1403). One state at least (Connecticut) has a law that compels the yearly examination of every oyster opener to eliminate typhoid carriers, and also has laws which forbid the fattening of oysters in fresh or contaminated water, and the sale of clams dug from regions where the water is polluted with sewage.

Butter made from infected milk may also be a carrier of typhoid bacilli, and flies can transport on their feet fecal matter, and therefore typhoid bacilli, to food and drink.

The essential agent in the causation of typhoid, Bacillus typhosus, has been found in the blood, in the feces, in the urine, and in the bile. It cannot always be discovered in the early days of the disease, but in the second or third week it can generally be detected. It may persist in the body for years, even as many as twenty-five or fifty, after a patient has become convalescent. It also may be present particularly in the feces and urine of persons who have never themselves, so far as can be determined, suffered from an attack of the disease. These persons are known as "typhoid carriers".

The most dangerous typhoid carrier is one who has typhoid bacilli in the urine. About 6 per cent of typhoid patients become intestinal carriers, and of these about two thirds become chronic carriers, the other third recovering completely within three months after convalescence. Besides the convalescent carriers of typhoid, Craig asys that we know that from 0.5 to 1 per cent of apparently healthy individuals harbor this germ and are classed as contact carriers, although he believes that they may at some time have had mild attacks of typhoid.

As a carrier of typhoid is a menace to public health, when he is discovered he should, if necessary, be supported by the state while under treatment for cure.

Methenamine will aid in the cure of kidney carriers of typhoid bacilli, but is of no value in gallbladder carriers. Carriers who have typhoid bacilli in the urine for a long time are likely to have an infected kidney. Probably most carriers who have the bacilli in the bowel for a long time have infected gallbladders; hence an operation for removal of the gallbladder may be

necessary to eradicate the infection. Gallstones are likely to form in any germ-infected gallbladder. The character of the gallbladder content may be determined by the duodenal tube, and the secretion thus obtained may show the bacillus of typhoid in the carrier.

In a series of 12 cases, cure of the carrier condition was effected through removal of the gallbladder by G. H. Bigelow and G. W. Anderson (J. A. M. A., July 29, 1933, p. 348). In all these instances gallstones were found and the symptoms associated with the gallbladder were cured. It is suggested that all carriers whose gallbladders are so removed should be followed after operation for at least a year by monthly examination of specimens and not definitely released until a negative bile culture has been obtained.

So far as we know, no state requires removal of the gallbladder in chronic carriers, and it would probably be undesirable to make such removal compulsory. Some state health departments encourage it and in Massachusetts, for instance, the cost of removal is borne by the state, when the person is a food handler. However, prior to operation, it is important (a) to have at least a year elapse after the disease in order to make sure that the carrier condition will not clear up spontaneously; (b) to obtain a specimen of bile in order to make sure that the carrier's condition is located in the biliary tract: (c) to make sure that the general condition of the patient is good.

There is some doubt as to the accuracy of the observations that more women are carriers than men. This fallacy has probably arisen from the fact that the typhoid carriers are usually detected in connection with food outbreaks, and women are more frequently food handlers than men.

Intra-uterine transmission of typhoid occurs. Wing and Troppoli (J. A. M. A., Aug. 9, 1930, p. 405) report the case of a mother convalescing from typhoid who gave birth to a convalescent baby with positive stools and a positive Widal reaction.

The incubation period of typhoid is variable, from three to forty days. It also varies with different epidemics (Miner, J. R.: J. Infect. Dis., September 1922, p. 296).

The triangular clean tip of the tongue is characteristic of typhoid and aids in diagnosis. The Widal blood test is considered diagnosic. Leukocytosis is generally not present in typhoid, even when serious addominal symptoms occur, such as perforation; hence the white blood count is of no diagnostic importance except as

After diagnosing the disease as typhoid, the physi-

negatively showing no increase in white cells.

cian should at once report the case to the health office. Even should the case be only suspicious of typhoid, the following precautions may well be taken. The feces immediately on being passed should be covered with an antiseptic solution and the hard masses should be broken up so that the disinfectant will thoroughly penetrate the fecal matter and come in contact with all micro-organisms. Disinfectants such as chlorinated lime, or liquor cresolis compound, 2 per cent, may be used. The feces may be allowed to stand for an hour in 1 part of official solution of formaldehyde to 10 parts of water before being placed in the toilet. Or, if desired, 1 part to 500 of corrosive mercuric chloride solution may be used, or a 5 per cent solution of phenol. The utmost cleanliness should be observed by the attendants. After movements of the bowels, the skin surrounding the anus should be carefully washed with a disinfectant solution, and the cloths used for this purpose should be put in paper bags and burned. The attendant also should, after bathing the patient, always wash her own hands in a disinfectant solution. The urine, also, should be discharged into a vessel containing a disinfectant solution.

The bacilli can sometimes be found in the sputum, and if the patient has a cough, the sputum should be

collected on paper napkins and burned

All bedding should be soaked in a disinfectant solution and boiled before being washed. The cups, glasses, dishes, knives, forks, spoons, and napkins used by the patient should all be disinfected before being washed.

During convalescence, the feces and the urine should be subjected at intervals to bacteriologic examination to determine whether the bacilli are still present. It has been found that they may be absent at one time, and may reappear later, so that repeated examinations are necessary. The patient should be carefully isolated until repeated examinations have shown the complete absence of bacilli, both from the feces and the urine. When these rules have been observed in the care of any patient suffering from typhoid, there is very little likelihood of his communicating the disease to any one else directly or indirectly.

As has been stated, the disease may be carried directly from the patient suffering from the disease. or from a so-called carrier. The bacilli may be received directly by a person who does not possess immunity to the disease by handling articles, such as clothing or utensils used in eating which have been contaminated by fecal matter, urine, or sputum from a typhoid patient. A far more common mode of infection is the indirect method, which embraces infection through water and through various food supplies. especially milk and oysters. Many epidemics have been due to the infection of a water supply from patients suffering with typhoid.

Jordan's (J. A. M. A., June 6, 1914, p. 1772) rules for the individual and the community in preventing

typhoid cannot be improved on:

## PHILES FOR PREVENTING TYPHOID

For the Individual

1. Keep away from all known or suspected cases of typhoid.

2. Wash hands thoroughly before meals. Do not use "roller towels."

- 3. Use drinking water only from sources known to be pure, or if this is not possible, use water that has been purified by municipal filtration or by hypochlorite treatment or by boiling in the household.
  - 4. Avoid bathing in polluted water.

5. Use pasteurized or boiled, instead of raw, milk,

6. Select and clean vegetables and berries, that are to be eaten raw, with the greatest care.

7. Avoid eating "fat" raw oysters and, in general, oysters and other shellfish whose origin is not known. 8. Be vaccinated against typhoid in all cases in

which any special exposure is known or feared.

# For the Community:

 Insist on the hearty cooperation of all persons with an efficient health officer.

Require notification and a reasonable degree of isolation of every known or suspected typhoid case.

3. Exercise strict control over the disinfection of known typhoid excreta.

4. Insist on pure or purified water supplies.

5. Require pasteurization of milk supplies.

 Regard all human excreta as possibly dangerous, and control their disposition in such a way as to prevent contamination of food or drink,

# VACCINATION AGAINST TYPHOID

The well informed physician needs no arguments to convince him of the efficacy of antityphoid vaccination or that it is a desirable procedure. The universal adoption of this method of protection by every one of the armies involved in the Great War, the very low typhoid rates prevailing among the troops of the various countries, the mildness of the disease which attacked the soldiers when they succumbed to the overwhelming doses of typhoid bacilli prevalent under the filthy conditions in the trenches in which they perforce had to live-all this is sufficient evidence to convince even the most skeptical that antityphoid vaccination actually protects. Large doses of typhoidinfected food or drink can cause typhoid in a vaccine protected person, but the disease will be milder and the mortality seems to be markedly less, though the duration of the disease may not be shortened.

The occasional cases of typhoid occurring among those vaccinated against the disease have been explained on the ground that the immunity created is not permanent and that it may be insufficient to crombat tremendous doses of organisms taken directly into the body by drinking baddy polluted water. The fact that a few cases did occur among immunized men should not deter the physician from the belief that the vaccine yields protection.

The average incubation period of typhoid is about two weeks. Its duration, when there are no relapses, is about two months. This means two weeks of incubation, four weeks of more or less serious illness, and two weeks before the real convalescence. Young adults and youths are most likely to contract this disease, although it may occur at any age. This is the age, then, for the greatest effort to be made in giving protective inoculations. All nurses and members of hospital staffs, students of colleges and seminaries, employees, and those who are interned in work houses, jails, prisons and asyltms, men in lumber camps, and all those who travel and are therefore subjected to varying water, milk and food supplies, such as "traveling" men, engineers, seamen, tourists and vacationists, should receive preventive vaccination against typhoid.

With all the advantages to an individual and to a community conferred by protection against typhoid by vaccination, the physician must also carefully consider what constitute contraindications. It seems advisable to examine every individual carefully to ascertain his condition of health before vaccination is done. It should not be done if he is suffering from any acute infection however simple; namely, from coryza, pharyngitis, tonsillitis, or any acute gastro-intestinal disturbance. Gonorrhea, synhilis, albuminuria, glycosuria, or the more serious conditions of chronic nephritis or diabetes are definite contraindications. The injections should be made in the afternoon, and the active symptoms will generally be gone by noon of the next day. Three injections should be given at weekly intervals. The method of injection is as follows: Paint with

tincture of iodine an area about 15 mm. in diameter at the insertion of the deltoid muscle. Inject subcutaneously, with sterile vaccine units, the graded doses of killed bacteria they contain. Then paint the region with collodino and allow it to dry. If proper care is taken, no infection will occur, and, as stated, a temperature reaction is rarely above 100 F., and perhaps never is as high as 102 F., even in exceptional instances. A severe reaction could occur only when there is some serious complication in the individual, as perhaps tuberculosis. All slight reactions are generally over in twelve hours and even severe ones do not generally last more than twenty-four hours.

The local reaction is greatest after the first dose, less after the second, and least after the third. Typically, there is an acutely inflamed area, varying in size, and not hard and indurated like an incipient abscess. The arm may ache, and the avillary glands may become tender. The local reaction is usually at its height in about ten hours, and, generally, nearly gone in twenty-four hours. Any more severe reaction is due

to contamination.

W. H. Park (M. J. & Rec., Nov. 4, 1925, p. 531) advises that if the first vaccine injection gives a strong reaction, it is better to repeat the same dose than to double it, and then to give two more half doses. Or one may be cautious and give half a dose at the first injection and then half for the second and third doses; the fourth may be a full dose. He says that "the more the dose to be injected is divided to make additional injections, the better the response." If there is no reaction from the first dose, one cannot promise there may not be a reaction with the second or the third. Even if there were no reactions to injections given many years before, new injections may cause a reaction. Park adds that in some cases the protection produced by the vaccine is only slight.

The dosage for children should be based on the child's weight and not on the age. The recommended adult dose is based on a weight of 150 pounds. It seems to be necessary for continued protection to revascinate children more frequently than adults,

namely, in about three years.

No death was recorded from the antityphoid vaccination of some 4,000,000 men in the United States army during the World War.

# TREATMENT OF TYPHOID

A. General Measures.—The patient with typhoid should be in a good bed and kept quiet. The usual measures, such as the use of a cleansing cathartic, should be instituted and simple fluid mixtures, such as lemonade or orangeade, may be given. Patients should be encouraged to change the position in bed sufficiently often to prevent the occurrence of congestion of any of the viscera and the development of bed sores. Alcohol rubs should be given to any congested areas on the back or hips; or, if the skin looks dark and congested, cushion rings should be used. Bed sores should not be

allowed. The bed pan should be chosen with the greatest of care. Some bed pans are made so that they are instruments of torture. First class hospitals are equipped with special beds for patients who are long ill, so that a middle section can be removed for the use of the bed pan. Besides frequent turning of the patient, the legs should be daily flexed and extended a number of times, voluntarily if the patient is not too ill, passively if the patient is too weak to make this effort. Such movements will many times prevent the development of oblebitis.

The mouth should daily be made as clean as possible. Cotton pledgets with applicators, or gauze pledgets with or without tooth powder or tooth paste, should be used to cleanse the teeth and tongue. Boric acid solutions are beneficial, or potassium chlorate solution if the gums are eroded or sore. If there are fissures or canker sores an occasional 25 per cent silver nitrate application to them is advised. Such care of the mouth is the best preventive of the serious complication of inflammation of the parotid glands. If the patient has pyorrhea alveolaris or a dirty bridge or imperfectly crowned teeth with pockets, the mouth will need extra care. Hydrogen peroxide solutions 1:3 should be frequently used as a mouth wash. Immediately after the peroxide wash, some mild antiseptic or soda solution is necessary to remove the acid froth. A tooth brush should not be used as it cannot be made sterile.

B. Diet.—Shaffer of New York first showed that typhoid patients, did not receive within 50 per cent of the kind of food that they required to save their tissues from destruction. Houghton showed that both the salivary secretion and the hydrochloric acid in the salivary secretion and in all probability the pancreatic piuce is diminished. In other words, the whole ability to digest is diminished more or less. With improper food, therefore, fermentation, putrefaction and consequently the production and absorption of toxins readily occur, and, with insufficient carbohydrates, acidemia is frequent.

Whether we have underfed our typhoid patients or overfed them, it seems that the evidence is very strong DIET

that milk alone is not sufficient food. In fact, when we consider the frequent difficulty in its digestion, and the large amount of it that must be given to satisfy the system either in calories or in protein, it would seem that we should rule against it as a typhoid diet.

It cannot be questioned that the high temperature, rapid pulse, delirium, and that association of nervous symptoms called typhoid are not caused by the typhoid germ alone, but by a double infection, and that the secondary infection is due to toxins or the products of secondary germs absorbed from the intestines.

Tympanites is an indication not of typhoid, but of intestinal putrefaction and fermentation, due to mistakes in the management of the bowels and in the food

administered.

It stands to reason, then, that primarily such food and arrangement of the movements of the bowels as cause the least tympanites and the least indigestion are of first importance in the management of typhoid. Second, the food which, so far as possible, satisfies the requirements of the body for nutrition and at the same time satisfies the requirements of easy and thorough digestion, should be the food of choice.

A liberal amount of fat in the diet will increase the calories, but not all patients bear fat well, especially early in the disease. Fat may be tried in the form of

cream, butter and yolk of egg.

Fruit juices, to which lactose has been added, may be given, as long as there is no diarrhea, but they should

be discontinued should diarrhea develop.

It should be borne in mind continually that some patients may not thrive on a high-calory diet. Should tympanites or other digestive disturbances begin to appear, it is well to modify the diet at once and especially to restrict the intake of milk and of lactose. If, on the high-calory diet, examination of the stools shows that undigested food is passed, the diet should be changed.

A good mixed diet for twenty-four hours, suitable for an ordinary adult ill with typhoid, is represented by one pint of milk; two eggs; one cup of thoroughlycooked, thin oatmeal gruel; the juice expressed from a pound of chopped round steak; a small cup of coffee, in the morning if delirum or meningeal symptoms are absent; a small portion of orange or lemon jelly made from gelatin; and enough salt and sugar in these foods to make them palatable. If meat or meat juices are not allowed, one or two tablets of the saccharated oxide of iron, each 3 grains, should be administered daily.

The milk may be administered, hot or cold, with or without salt, Vichy or lime water, in two or three dose, as deemed best in the individual instance. Sometimes koumys makes a valuable substitute for ordinary milk, or buttermilk may be given in large quantities. Actiophilus milk is often advisable, but it must be emphasized that any diet or food that causes excessive gas in the stomach or intestines should be storped.

The eggs may be given raw, beaten up with a little milk or given with lemon juice on cracked ice. They are better given poached, or, if the temperature is not high, soft boiled or in the form of boiled custard.

The oatmeal gruel should generally be made with milk, and thoroughly cooked, strained and salted to suit the taste.

Meat juice is best prepared by just covering the chopped steak with water, and allowing it to stand for an hour and a half. The water and juices are then expressed out of the meat. This watery extract will then contain, besides the blood of the meat, actual muscle serum, which is a decided tonic. This expressed fluid is then kept on ice and administered, properly salted, in two or three doses. If the patient is not too ill, the meal may be made more agreeable by allowing the patient to chew broiled steak, but not to swallow the fibrous portion.

Gelatin is generally pleasant to most patients. It also has some nutritive value, and possibly tends to aid normal coagulation of the blood, and perhaps prevents capillary bleedings from the inflamed intestines. The calcium of the milk also aids in preventing bleeding. If milk is not given, lime should be administered as calcium lactate.

A patient who is accustomed to his morning coffee need not be deprived of that pleasure because he has typhoid, unless there are meningeal symptoms, or meningitis is actually present.

Experience seems to teach that it is best to administer nutriment to the typhoid patient in small amounts at three-hour intervals. The patient should, however, have normal rest. In other words, he should not be awakened from a comfortable sleep because it is time to do something to him or for him. The reguar three hour feeding intervals should be the periods for other treatments. During the night, if he is not seriously ill, he should not be disturbed as often as every three hours. If the tongue is much coated, 5 drops of the official dilute hydrochloric acid should be given, well diluted, after the protein meals.

With the treatment outlined and with proper care of the mouth, the patient's tongue is rarely badly coated and is generally moist, and there should be no nausea or tympanites. Great care of the teeth and tonsils, especially if there is infection, may prevent secondary infections and the serious complication of

inflammation of a parotid gland.

C. Colon Enemas .- It has lately been shown that fecal deposits, seeds or other food débris may become lodged in the lower corner of the ascending colon, the cecum, and may cause inflammation or symptoms of appendicitis, and may even be a subsequent cause of appendicitis. Hence it may be found to be good treatment, in the first few days of typhoid, to give colon enemas of from one to two quarts of warm water, the patient lying on his right side, to aid in washing away the possible accumulations in the cecal region. Such colon washings can certainly do no harm in the first days of typhoid, and may be of marked benefit in the future course of the disease. In other words, if the pathologic process in the intestines is considered thoroughly from a surgical standpoint, with the aim to keep the ulcers and the inflamed intestinal mucosa as clean as possible, less secondary infection, tympanites, deep ulcerations, hemorrhages and perforations will result, the fever will not be as high and the whole prognosis will be better.

D. The Fever.—Hydrotherapeutic measures have become universal in the treatment of the fever in typhoid patients. The so-called Brand baths are not indicated; simple sponging for pyrexia will, in most

instances, accomplish all that is desired.

E. Medicinal Treatment.—Not only should the bowels be cleared at first, but subsequently the bowels

should be moved daily. This is best done by administering every other day some gently acting saline laxative, which cleans the upper part of the intestines, tends to drain the portal circulation, to keep the liver, the body's Pasteur filter, in a healthy condition, and to cause an easy soft movement. If gas is caused by this small dose of saline, a small dose of a mild laxative may be given, Any tendency to a diarrheal condition or to too many movements from such a laxative may be stopped by the administration of 1/10 grain of morphine. The bowels are thus cleaned and subsequent excessive peristalsis inhibited, and the patient is generally at rest for the remainder of the day. On the alternate day a small glycerin enema, consisting of a tablespoonful of glycerin and a tablespoonful of water, administered with a glass syringe, will within ten minutes cause a movement of the bowels that will at least empty the descending colon and cause the expulsion of gas. management of the bowels seems contraindicated only by intestinal hemorrhage, signs of perforation and great prostration. Such treatment also prevents secondary infections that keep the temperature high. In other words, if the patient's bowels have moved daily and the movements are not caused by diarrhea due to irritation from the disease, tympanites is not present and less antipyretic measures are needed. If, in spite of the proper care of the food and bowels, tympanites occurs, a hypodermic injection of pituitary extract will generally aid in expulsion of the gas. Sometimes the injection of a sterile extract of ergot will act successfully in causing contraction of the intestines.

The best antiseptic to the upper part of the intestines seems to be salicytic acid in some form, and one of the best forms is the combination with phenol, viz., phenyl salicytate (salol), which may be given in capsules without any disturbance of the stomach, as it is there undissolved and breaks up in the duodenum. A small dose of this drug (0.25 Gm. or 4 grains) every six hours may be given continuously through the disease, unless there is a diminished excretion of urine, or albuminuria develops, or the urine shows darkening from the phenol, which would occur rarely from this small dose. Even the nonbelievers in bowel antiseptices must admit that whether the colon bacilli or

typhoid bacilli come to the upper part of the intestine by migration, or reach these regions through the blood stream, they are less likely to survive in the presence of salicylic acid; moreover, phenyl salicylate is an anti-

septic for the kidneys and bladder.

Yeast may be of value, as bowel infections of most kinds are made better by the administration of yeast. The value of sour milk treatments in typhoid must be determined by the individual case. A patient, however, who is not doing well on the diet suggested above should be put on the sour milk treatment. One of the principal objections to such treatment is that the patient soon objects to any one diet that is to be long continued. although for a few days the soured milk might be accepted. On the other hand, most patients do not object to the sour drink produced by the solution of a five-eighths inch cube of a compressed yeast cake in a glass of water, given two or three times a day. Bacillus acidophilus milk and good doses of lactose may be found of advantage in preventing fermentation in the intestines

If the heart shows signs of weakness, strychnine, caffeine and camphor may be given. A sufficient dose of strychnine is 1/30 grain (2 mg.) by mouth three times in twenty-four hours, or twice in twenty-four hours hypodermically. Alcohol is of no value as a cardiac stimulant, and digitalis should not be used after a heart has been subjected to prolonged fever. An occasional dose of atropine sulphate might be prescribed. When in the latter part of typhoid the heart is failing or irregular, and especially in convalescence, smokers may be allowed from one fourth to one half of a cigaret at a time several times a day, and strange to say the heart action will become more regular and the blood pressure will be improved. The height of the blood pressure should determine when a patient should first sit up. Convalescence should not be rushed.

F. Vaccine Therapy.—Vaccines for the treatment of typhoid are of doubtful value and may do harm. Neuman (Am. J. M. Sc., November 1922, p. 690) makes the interesting suggestion that recently immunized blood should be injected by transfusion in serious typhoid cases, and when a hemorrhage requires transfusion. Of

course, typed blood must be used.

G. Convolescence.—The patient should be kept in bed until the pulse regains its normal rapidity and the blood pressure is not too low. The amount of exercise he is allowed to take should not be such as will much increase the action of the heart beyond the normal rate.

The patient should first be allowed to sit up in bed. If this results in a marked increase in the heart rate, he should not be allowed to get up. The blood pressure will aid in determining the activity that should be allowed. It is also important that the nervous system should not be subjected to unusual irritation, and that the patient avoid cares and worries as far as possible. Any anemia should be treated as mentioned in connection with other infectious diseases. Protracted rest and a simple diet are essential features of this protective treatment.

Before releasing the patient from observation, the stools and urine should be examined repeatedly for the presence of typhoid bacilli.

### PARATYPHOID

There are at least two types of bacilli that cause this form of typhoid, and both are combined with the typhoid bacillus in the vaccines used for protective inoculations. This infection reaches the human in the same manner as does the typhoid infection. While this form of fever is generally milder and shorter, and is not considered as dangerous to life or as likely to cause serious complications, it can cause hemorrhage, perforation and death. Hence, the care of the patient must be just as watchful as that for the more serious disease.

#### TYPHUS FEVER

From 1917 to 1921 typhus fever raged in many parts of Russia, and it was estimated that there were 25 million cases, with a mortality of 10 per cent. Thousands of physicians succumbed to the disease. In 1915 there was a serious epidemic of typhus in Serbia causing the death of approximately 150,000 people. The disease occurs mostly in winter and early spring, probably because during these colder months there is more crowding of people, and therefore more opportunity for infection.

The recent developments in our knowledge of the etiology and transmission of this disease have been largely due to American investigations. These advances have resulted from the clinical observations of Brill and the experimental work of several scientists, notably

Ricketts, Anderson and Goldberger.

Typhus fever, so far as is known, seems to be caused by Rickettsia prowazedi. It has been demonstrated that the disease is communicated by the body Jouse and probably also by the head Jouse. This observation explains many puzzling features. McCrae remarks, there is a decrease of infection when the patient is removed to thought and there is great danger to attendants in explains the patient is removed to thought and there is great danger to attendants in the disease about therefore always be treated in a hospital, and attendants should carefully protect themselves against contamination through contact with lies.

The fact that the disease may be transmitted to monkeys has allowed exact experimental work on it. Typhus fever formerly was prevalent in epidemics, and also occurred sporadically, being known under the names of jail fever, camp fever, ship fever, etc., terms which indicate its close association with overcrowding and filth. With the progress of sanitary science, the prevalence of the disease decreased until it appeared to have vanished with the march of civilization, especially

in this country.

In the United States the disease, in its typical form, has been found usually in shipe coming into our seaports. A mild form of the disease has been discovered even in our farthest inland cities. The existence of this mild form should be borne in mind not only as explaining puzzling cases but also as the possible source of epidemics when the organism may assume unusual virulence or the opportunity for transmission is unusually great.

Bedford Shelmire and Walter E. Dove (1. A. M. A., Feb. 21, 1931, p. 579) report the occurrence of 11 proved and 125 probable cases of endemic typhus fever in Texas in conjunction with a skin eruption produced by the blood-sucking rat mite, Liponyssus bacoti. Hirst. They thought it possible that the typhus was trans-

mitted by this same parasite.

Typhus fever is more widespread over the world than has been recognized. Modern evidence is quite distinctly tending toward the point of view that the epidemiologic behavior varies according to conditions. many of which are unknown and require further elucidation

For several years the Public Health Service of the United States has been investigating a severe sporadio type of typhus fever which has been occurring in the southeastern part of the United States. These severe cases of general systemic disease with serious complications were for a long time not recognized as typhus. Latterly, it has been positively proved that the typhus

germ is responsible for this infection.

The epidemic form, according to Brill, usually begins rather suddenly with a chill or chilly sensations, though it may occasionally be preceded by malaise and general body pains for two or three days. Headache rapidly supervenes and fever immediately appears. These symptoms are quickly augmented, so that by the second or third day the fever may have reached 104 or 105 F. As the disease progresses it is marked by profound toxemia, signs of intense blood infection. marked involvement of the nervous system manifested by delirium, excitement and tremor, or by somnolence, stupor, coma, and an unusually severe involvement of the muscular system, with physical exhaustion. The eruption of real typhus fever is more profuse than that of typhoid. There may be tremor of the tongue, hands and lips. If the mouth is not properly taken care of, there will be foul matter on the lips and a badly coated tongue. Trench fever is a mild form of typhus, and is also carried by the body louse. The pathologic condition in the central nervous system, when affected, has been found by Hassin to be an acute, disseminated encephalomyelitis, nonsuppurative in character.

Epidemic typhus fever is a disease of the winter months. This infection is no respecter of age or sex, although it does not seem to attack children quite as frequently, and when they are affected the disorder is milder than in adults. One attack seems to confer permanent immunity against reinfection. The incubation period has been found to vary from one to two or three weeks. The endemic or mild form of typhus fever and the epidemic typhus fever are alike in their onset. in the first stage of the eruption and in the critical decline. In all other respects they differ. The eruption in the mild form (Brill's disease) rarely goes to the hemorrhagic stage; it is always an erythema. The mortality from Brill's type of typhus infection has been shown to be less than 1 per cent, while the mortality from the regular typhus may be as high as 20 per cent. It has been suggested that inoculation with Brill's type would be protective against typhus fever. There is no profound involvement of the nervous system : there may be a slight delirium, but it is mild in type, appearing only at night. The patient is never, or rarely, stuporous, and never seized by maniacal excitement; he never goes into coma, and has no muscular tremors, subsultus, or carphology. Involuntary discharge of urine and feces are not seen in the mild form of typhus fever. In the mild form, however, the headache, instead of diminishing about the eighth day as in the epidemic form of the disease, becomes progressively more intense even up to the end of the illness.

The disease lasts about ten days and ends by crisis and sweating. The eruption which occurs, especially on the lower extremities, does not develop desquamation.

Typhus fever is often confused with other infections, such as typhoid, cerebrospinal meningitis when that disease is of the systemic type with eruption, and also, when mild, with measles,

All unhygienic conditions predispose to this infection, but of course the louse must first become infected. One case alone of the disease, especially in crowded quarters, may rapidly lead to a spread of it.

The prevention of the spread of this disease is a comparatively simple problem, although, as experience in the Great War showed, it may be difficult to accomplish. It consists essentially in the destruction of vermin. This involves, of course, at the same time the removal of fith, cleanlines of the inhabitants, and the prevention of accumulation of waste. The body louse has six legs with which it sicks to clothing. It does not crawl on the body; hence, a stripped person may be free from these vermin while the clothing is alive with them.

In disinfecting the room in which a typhus patient has been, formaldehyde is not satisfactory. Spraying

with a 5 per cent solution of phenol into all the crevices of the room seems efficient. The clothing is best deloused by heat. Strong odors, even strong cologne, keep these lice away from a person. As the louse must feed frequently to live, it is likely to leave clothing or bedding that has not been recently in use. The eggs of the louse often get into the hair, and the head louse may carry the disease. One female may deposit 8,000 eggs in a week's time. The hair should be kept short, brushed daily and washed, at first with equal parts of kerosene and vinegar. The vinegar loosens the eggs from the hair and the kerosene kills the lice. The person found to be a carrier of body lice should have daily baths and the underclothing should be laundered at least twice weekly. The outer clothing should be changed weekly to that which has been properly cleaned and subjected to heat.

#### TREATMENT

The treatment of typhus fever is similar to that described for typhoid. The diet is the same as that recommended for the acute stage of typhoid. One of the chief measures of importance is the provision of adequate amounts of fluid. The patient should be given from three to five quarts in twenty-four hours. Physiologic sodium chloride solutions by rectum, subcutaneously and intravenously, are recommended by Roberts of Calcutta. Sleeplessness is a common symptom and should be combated with hypnotics. In delirium some sedative hypnotic should be given, and large doses of calcium. If little food has been taken, acidosis may occur and must be counteracted. The treatment of circulatory failure is the same as that for any other acute illness. A. S. Rumreich (J. A. M. A., Feb. 4, 1933, p. 331) emphasizes the need for keeping the patient quiet, physically and mentally. A copious intake of fluid is highly desirable. Constipation is best relieved by enemas. Antipyretics should be avoided but tepid sponging is of value.

### ACUTE DYSENTERY

Acute dysentery is an inflammation of the large intestine, involving either the whole or only a portion of it. Sometimes the lower part of the small intestine is inflamed coincidentally. The disease may be due to various irritants of microbic or parasitic origin, giving essentially similar symptoms but requiring different treatment directed toward the cause of the disease.

The disease is characterized by the passage of stools containing mucus, blood and pus, accompanied by much straining, colic and tenesmus. The following classes of dysentery may be noted; bacillary, amebic, balantidium and dysentery arising from some unknown infection. The disease is infectious, and may be transmitted by the feces or articles contaminated with them. It occurs in epidemics and also sporadically. When dysentery occurs sporadically, it is generally more amenable to treatment.

#### SYMPTOMS

The general symptoms of acute dysentery are mild fever, a variable pulse, at times rapid or weak from exhaustion, with a tendency to collapse, and frequent and exhausting movements. The nearer the rectum the inflammation is, the more intense is the tenesmus and the more constant the desire to strain, with resulting small movements and but little relief. The higher up the inflammation is in the large intestine, the more severe the griping and abdominal pain. The stools consist of large masses of mucus mixed with feces, and later mucus, more or less blood-streaked, perhaps without any fecal matter at all. Later, slight hemorrhages occur, depending on the amount of ulceration or erosion of the membrane, and finally pieces of membrane are passed similar to diphtheritic membrane. The tongue is coated, but generally moist, unless a large amount of fluid is lost. If the progress of the disease is unfavorable, the temperature is likely to rise high; otherwise, it remains low. If the disease continues long and the movements are frequent and profuse, a typhoid state develops.

### GENERAL PRINCIPLES OF TREATMENT

The first steps in the treatment are rest, the removal of irritants, and nourishment that is most easily assimilable. These principles apply to all forms of dysentery. The patient should remain in bed, using the bed pan when necessary. If the condition of the patient will permit, the rectum should be inspected with a speculum or with a proctoscope and a piece of mucus or a scraping from an ulcer, if any is visible, obtained for examination. This should be examined immediately on a warm slide for amebas. If no amebas are found the mucus and feces should be examined for bacteria causing dysentery. Following this examination the rectum and colon should be irrigated with physiologic sodium chloride solution. After the fecal matter and mucus have been washed away and the water is returned clear, the colon may be treated with a weak notassium permanganate solution, 1:10,000. When these irrigations are made the tube should not be pushed too far, as this might increase the injury to the rectum. A few inches is sufficient. Such irrigations may be repeated once a day in the early stages.

The Dist.—The diet should consist of rice water bouillon, beef juice, chopped beef, or other suitable food. If the tongue is coated, the foods mentioned agree better than milk, but if the tongue is clean milk may be given either alone or with some other food. The food must not be cold. Milk predigested with pancreatin may obviate the tendency to the formation of an undue amount of intestinal gas. It should be remembered that milk often may not be the proper food in a given case of dysentery. Meat and eggs may be better. Plenty of water should always be taken.

If milk is desirable but is distasteful, it may be diduted with carbonated water; or the milk may be given hot and salted. Preferably it should be pasteurized. Whether or not milk is administered, lime should be given in some form, as calcium is lost from the body in increased amounts in all forms of diarrhea. Calcium carbonate or calcium lactate may be the preparations used. The calcium should be in a non-irritant preparation; therefore calcium chloride should not be used.

Tea and coffee may be allowed at the times of day when sleep will not be disturbed. While large amounts of water are inadvisable and iced water should not be given, still, if much water is lost by way of the stools, the amount must be equaled by that which is ingested; otherwise the patient's tissues lose water, the blood becomes concentrated, the urine is scanty, the skin is dry, the temperature rises and the patient suffers from this deprivation of water. Such a condition alone may be the cause of death. Preferably, liquids or foods should be given warm, as anything cold entering the stomach is likely to start peristalsis. It may be advisable to give some thin cereal gruel once a day, at least if the disease lasts more than a week.

As soon as convalescence is established, broited lamb chops, roast beef, and the white meat of chicken may be added to the diet. All solid food should be thoroughly masticated and the digestion may be hastened by giving a few drops of diluted hydrochloric acid directly after meals. As convalescence progresses favorably, toast, stale bread, and boiled rice may be added to the diet and, later, baked potatoes. The first fruit allowable is either lemon or orange uiuce.

### MEDICINAL TREATMENT

It is generally advised to give at once a dose of castor oil or a dose of calomel, with additional saline laxatives if necessary.

Bismuth subcarbonate may be administered in large doses, but the value of this is often problematic. However, if the inflammation is in the occum or has migrated into the ileum, bismuth is of benefit. Bismuth, however, must not be continued too long, as it tends to form scybalous masses and cause more irritation and more inflammation.

Pain and too frequent movements should be stopped by small doses of morphine. Tenesmus is relieved by small ice water enemas or by suppositories of morphine and atropine.

### TREATMENT OF BACILLARY DYSENTERY

The microscopic examination may show any one of a number of dysentery organisms; for example, the Flexner, Shiga, and other types. Such examination should include fermentation tests and other biologic reactions as well as a study of morphology. The classification, while a matter of great scientific interest, is not, however, an important guide for the prognosis or treatment.

There seems to be, at present, no question that antidysenteric serum is of value in the treatment of bacillary dysentery. It is not wise to wait for laboratory determination of the type of bacillary dysentery present in a given case. Therefore a mixed anti-dysenteric serum antagonistic to both the Shiga and Flexner types of dysentery should be immediately utilized. There are available antidysentery serums prepared from the strains of Shiga, Kruse, Flexner and Hiss. The serum contains both antibacterial and antitoxic immune bodies. This serum comes in 50 cc. containers, and may be injected subcutaneously, intramuscularly, intravenously or by rectum. In mild cases the dose is from 20 to 40 cc.; in severe forms from 60 to 80 or even 100 cc. at once, if deemed advisable. One dose is generally sufficient, and it seems rarely necessary to give more than three or four injections. If the serum is not given early in the disease it seems of little value, and need not be given after the sixth day. If the first dose does not cause satisfactory amelioration of the symptoms, a second dose may be given after two days. Only in severe cases does the serum need to be given intravenously; subcutaneous injection seems satisfactory. The serum has been given in a 5 cc. dose as a prophylactic, but any protective action does not last more than a short time, probably at most two weeks.

weeks. It the disease progresses and immediate healing of the inflammation does not occur, and actual ulceration of the inflammation does not occur, and actual ulceration betteding an occasional irrigation of silver nitrate, 1 part to 1,000, not more than 1 pint at any one time, viz., 0.50 Gm. (7½ grains) to a pint of water, is of benefit. Such an injection should be given only once in four or five days, and if the liquid does not immediately flow out of the intestine a solution of sodium chloride should be injected at once. The salt, forming an insoluble silver chloride, will prevent any poisonous absorption of intrate of silver.

### AMEBIC DYSENTERY

Amebic dysentery describes an infection of man by a protozoan parasite, Endamoeba histolytica. Originally considered a tropical disease, the infection is now frequently observed in the temperate zones. There are numerous carriers of the infection; it has been estimated that from five to ten per cent of the population may have the organism in their intestines. The incidence of Endamoeba histolytica among 1,336 adult permanent residents of San Diego city and county was 2.1 per cent, and among 513 children was 0.4 per cent as found by H. S. Sumerlin (J. A. M. A., Feb. 3, 1934, p. 363). Endamoeba histolytica was present in 26.5 per cent of 83 Indian boys in Wyoming who were examined by W. B. Owen et al. (J. A. M. A., March 24, 1934, p. 913). In a protozoal survey of 1,000 inmates at San Quentin Prison, infestation with Endamoeba histolytica was found in 9.2 per cent by H. G. Johnstone et al. (J. A. M. A., March 11, 1933, p. 728).

When the ameba invades the intestine, it burrows under the submucous coat and produces its harmful effects by destroying the tissue with which it is in contact. Haughwout says that there is no evidence that the ameba furnishes any toxin; it is incapable of producing an inflammatory reaction in the tissues. "Its attack on the intestine is purely through the action of the proteolytic enzymes it produces and uses in the procuring and digestion of its food."

# SVMPTOMS

When a human being is infected with the ameba, he may develop an acute condition. He may be for a while without symptoms and eventually may develop a chronic condition. In acute amebic dysentery, the onset is usually sudden. There is severe pain in the abdomen, which is followed by an intense desire to defecate. There is severe abdominal pain, nausea and vomiting.

The diarrhea is exceedingly serious and severe, there being from fifteen to thirty-five movements during twenty-four hours. The stools are largely fluid in character, containing mucus, blood and shreds of mucous membrane. Tenesmus is severe. In the majority of cases, these conditions persist for three or four days and then clear up, to be followed by further mild attacks from time to time. In some cases chronic amebic dysentery supervenes.

When the condition becomes chronic there are repeated attacks of colic and diarrhea, loss of appetite and the appearance of blood and mucus in the stools, Between attacks loss of appetite, disturbance of sleep, and other symptoms are noted which indicate the presence of disease.

#### DIAGNOSIS AND DIFFERENTIAL DIAGNOSIS

In the presence of an outbreak, a physician should ot course be on the alert for the possibility of this disease in all forms of diarrhea, but particularly when the patient's history indicates the possibility of contact with a carrier of the ameba. The typical attack may be diagnosed by an experienced diagnostician. The conclusive diagnosis is dependent on finding the organism in the stools. Cases of amebic dysentery have been mistaken for bacillary dysentery, mucous colitis, ulerative colitis, appendicitis, peritonitis and other disorders. It must be remembered that symbiotic infection with amebas and dysentery bacilli may occur. H. L. Weinberger (J. A. M. A., March 24, 1934, p. 916) reports 3 cases of dysentery in one family, in which the Bacillus dysenteriae was isolated sixty days before the discovery of Endamoeba, histolytica.

The more serious complications which develop in amebic dysentery are those related to the formation of abscesses in the liver and in various other organs of

the hody.

### LABORATORY EXAMINATION

While a conclusive diagnosis of amebic dysentery rests primarily on the demonstration of E. histolytica in the stools, a negative report does not necessarily mean absence of infection. As a rule only the motile forms (trophozoites) of E. histolytica are found in liquid or semiliquid stools, while cysts are usually found in formed stools. However, flakes of blood or mucus on formed stools frequently contain motile forms. The best results will be obtained by examination of freshly passed specimens.

To obtain motile forms from persons passing formed stools, a suitable dose of magnesium sulphate should be administered and the first liquid stool examined (Report of a Special Committee, 1. A. M. A., Feb. 3, 1934, p. 369). Stools are unsatisfactory for examination when they follow the administration of oil, barium, bismuth or oily suppositories; the container used for

collecting the specimen should be clean and dry. For the exact technic of staining and making the examination see the report of the special committee.

# SPREAD OF AMEBAS

There has been continual immigration into this country of ameba-infested peoples, beginning with the importation of Negro slaves from Africa, according to H. G. Johnstone et al. (J. A.M. A., March 11, 1933, p. 728). During the latter half of the nineteenth century great numbers of Chinese coolies and Japanese farmers came to the Pacific coast, and Hindu laborers were brought in to work on the railroads. In more recent years there has been an influx of Filipinos and Mexicans.

Large numbers of our own people migrate to endemic areas and return home infested.

The public in recent years has greatly increased its consumption of raw fruits and vegetables. These products sometimes come from parts of the country that are highly endemic for amebiasis. Contamination is easy and lack of cooking removes one factor of safety.

It has been said that probably the most important single method of spreading the disease is by infested food handlers. The outbreak of amebiasis in Chicago, during the summer of 1933 was at first thought to have been spread in this way. However, later evidence appeared to be sufficient to warrant the opinion that this outbreak originated in two hotels as a result of the contamination of the water supply of the hotels with sewage (editorial, I. A. M., A., Feb. 3, 1934, p. 375). Thereafter, no doubt, widespread infection of the food handlers and the employees of the hotel in general served to aid in the spread of the infestation to guests.

It is obvious that there are throughout the United States, numerous buildings with antiquated plumbing incapable of withstanding the stresses likely to be placed on it by the demands of modern congestion. Until such equipment is inspected, cross connections eliminated, and the entire equipment brought up to date, there can be no assurance that similar outbreaks of amebiasis may not occur where similar conditions prevail.

## COMPLEMENT FIXATION TEST

Col. Charles F. Craig, U. S. Army, retired, and now director of the Department of Tropical Medicine of Tulane University School of Medicine, New Orleans, has done an enormous amount of clinical and research work on amebic dysentery, one phase of which has been the development of a complement fixation test for the diagnosis of amebiasis which, he believes, has practical value as a diagnostic method. The technic of this test is practically the same as that of the standard method of performing the complement fixation test for syphilis used in the U. S. Army laboratories. The chief difference in the technic of the two tests is in the preparation and titration of the antigen used. Craig uses an alcoholic extract of cultures of Endamoeba histolytica grown on a modified Boeck-Drbohlay medium. takes a rich culture of this organism grown on the medium and develops subcultures until there are available at least 120 cultures of the organism for extraction with absolute alcohol. It is necessary to use great care in titrating this antigenic extract for hemolytic qualities. anticomplementary qualities and antigenic strength. The technic of the test is important and should be attempted only by a trained serologist. The use of the undiluted alcoholic extract of Endamoeba histolytica as the antigen makes the test very delicate and subject to extreme error unless the exact technic is followed. The practical value of the test, therefore, is limited particularly by the difficulty of preparing the antigenic extract. Craig described his technic in detail in the September. 1929, issue of the American Journal of Tropical Medicine. He reported in this article some of the results he obtained with the test. In the June, 1933, Journal of Laboratory and Clinical Medicine he described further observations on the test and reported results obtained in testing 1,000 persons. The test, he says, has proved of value in the diagnosis of cases of amelia abscess of the liver unaccompanied by intestinal symptoms; also in the diagnosis of apparently healthy "carriers" of Endamoeba histolytica, and of those presenting mild symptoms of infection; also in the control of antiamebic treatment. The strongest positive results are usually obtained with the test in "carriers" who have no symptoms of amebiasis or in persons who have mild symptoms of the infection. In some severe cases of acute amehiasis, he found the reaction doubtful or negative, although in most severe cases the reaction was positive. Persons infested with other species of ameba or with the intestinal flagellates do not give positive complement fixation with this test unless Endamoeha histolytica also is present. Normal persons or those ill with other diseases do not give a positive complement fixation reaction unless they also harbor Endamoeba histolytica. The specific complement fixing bodies disappear from the patient's blood serum following antiamebic treatment and the disappearance of Endamoeba histolytica from the feces. In relapsing cases of amebiasis, the test which has been negative during the interval of apparent freedom from ameba again becomes positive, sometimes even before the parasite is again demonstrable in the feces. Unless repeatedly negative for several weeks, therefore a negative reaction does not prove the absence of amelic infection or that antiamebic treatment has resulted in a cure.

Whether the amebas are on the surface of the mucous membrane, deeply embedded in the ulcers, or localized elsewhere in the body, they may be reached by properly administering ipecac and emettine. The amebas on the surface of the mucous membrane are not likely to be affected by emetine administered hypodermically. On the other hand, emetine given hypodermically becomes more quickly active on the deep-seated organisms and the localized lesions. Jones reports that the following method of administration is

used at the army hospital in Manila:

Emetine hydrochloride, 0,008 Gm., is given hypodermically, for ten days (twice a day for four days and once a day for six days). Ipecac, which is started about the eighth day with from 1.5 to 2 Gm. doses given at bedtime, is continued for three consecutive nights and thereafter decreased by 0.3 Gm. each night. The disagreeable effects of the ipecac were never manifested. To prevent vomiting the administration of ipecac may be preceded by a hypodermic of ½ grain (8 mg.) of morphine. The ipecac may be administered in capsules coated with phenyl salelylate in order that it may have no action in the stomach. When thus administered, the morphine is not needed. Emetine bismuth iodide is another preparation of emetine that is often used.

Happy though the results of this combination may be in treating amebiasis, the fact should not be overlooked that emetine is an amebicide and has little to do with the healing of ulcerations. Every case of amebiasis should, after this treatment, be considered one of ulcerative colitis and every effort should be made to enhance resistance by change of climate or tonies to obviate the distressing sequelae characteristic of the disease.

The ulcers should be treated by rest in bed, proper diet and local irrigations. The latter not only serve to promote healing but also act to prevent relapses.

Quinine sulphate is believed by many to be specific in its destructive action on the amebas, and is much used for irrigating the rectum and colon. It should be used in a 1 to 5,000 to 1 to 1,000 solution. Cures have been effected by such irrigations. Solutions of the quinine bisulphate in a strength of 1 to 2,000 (warm water) have been found successful in destroying the amebas.

Bates, who has treated a great many of these patients successfully in the tropics, has outlined the treatment as follows: Complete rest in bed. Give a saline purge or other cathartic; give 1/2 grain (0.03 Gm.) injections of emetine daily until 2 grains (0.13 Gm.) are given; then increase the dose to 1 grain (0.065 Gm.) daily until the stool is clear of amebas. Usually a total of 5 (0.3 Gm.) to 6 grains is required. Discontinue the emetine and give large doses of bismuth subnitrate; 1 drachm (4.0 Gm.) every four hours during waking hours until the stools are well formed or constipation occurs; then decrease the dosage gradually. As soon as the effects of the saline purge wear off begin enemas of saline solution, two or three quarts at a time every four hours during waking hours. Discontinue when beginning with bismuth, using only once or twice a day to counteract constipation. As for food, give milk every two hours during the day in quantities of from 4 to 8 ounces. As improvement continues gradually add poached eggs, dry toast, etc.

Several observers have suggested the use of oil of chenopodium in much the same way as it is administered for hookworm disease. Neoarsphenamine injections have been given and stovarsol (acetarsone), another preparation of arsenic, has been used in amebic dysentery. It is given in doses of 0.25 Gm, in tablet form three times daily by mouth for one week only, After an interval of a week or ten days a second course may be given if the amebas persist.

Carbarsone, another arsenical, is used in chronic amebiasis in the dosage of 250 mg, in gelatin capsules twice daily for ten days. In 30 of 33 cases in which the patients were treated in this way, the stools were free of Endamoeba histolytica, with prompt relief from symptoms and general improvement in physical condition without any untoward effects

Chiniofon is administered orally and by enema in the treatment of acute amebic dysentery. For an adult, the course of treatment consists in the oral administration of 1 Gm. (15 grains) three times a day for eight to ten days, intermitted for a week to ten days, and then repeated. Severe diarrhea may be caused by the recommended dosage and, if so, the dose should be reduced one-half. To secure the best results, enemas of chiniofon should be combined with the oral treatment: 0.5 Gm. (71/2 grains) of chiniofon should be administered three times a day by mouth and a daily enema should be given of 200 cc. of a 2 per cent warm water solution of chiniofon, which should be retained for several hours.

N. A. David et al. (J. A. M. A., May 27, 1933, p. 1658) have used a product related to chiniofon, known as iodochloroxyquinoline (vioform, N. N. R.). This product is given in a dose of 0.75 Gm. by mouth in gelatin capsules daily for ten days, with a repetition of the course of treatment after a rest period of one week. In 39 of 47 cases of human amebiasis the stools failed to show Endamoeba histolytica on repeated examination over a period of four months after treatment was stopped. Amebas recurred in the stools of 5 patients within two months after treatment was stopped, but were eradicated by repetition of the treatment.

If, in spite of the remedies which have been enumerated, the case still continues rebellious, surgery may be deemed advisable. Appendicostomy may be performed, and the colon irrigated by the insertion of an irrigation tube through the appendix.

Great care and patience are required in the treatment of this disease, and the treatment should be long continued. After the patient is apparently cured, he should be kept under observation for months in order that, if a relapse occurs, treatment may be promptly

instituted

Abscess of the liver is a not infrequent complication. In such cases there is usually recovery with emetine treatment if it is instituted early. It may be necessary, however, to open and drain, especially in the event of secondary infection.

### INFLUENZA: GRIP

During the latter part of 1918, extending into 1919, and again in the early weeks of 1920, a pandemic of influenza and influenza long influenza and influenza long the world and caused as great a mortality as any other epidemic in the world's history. Another severe epidemic occurred in 1928, and cases seen late in 1932 and early in 1933 seem to have been of the same type. More articles appeared in the medical literature on this subject than on any other during that time. It would be impossible and, in fact, undesirable to review here all this literature or even to consider the articles dealing with treatment. Suffice it to say that there is no good evidence that any treatment other than one purely symptomatic had any specific virtues in controlling the disease.

### ETIOLOGY

The organism described by Pfeiffer in 1891 has long been known as the influenza bacillus, and good observers have found it constantly present in cases of this disease. However, there has never been convincing evidence of its relation to influenza, for it is frequently found in many other diseases as well as in normal throats. There are a number of organisms varying greatly in pathogenicity, which are grouped under the name of Pfeiffer's bacillus. Mathers found a green-producing streptococcus in many patients dying of this

disease, and Rosenow and many others have been able to find it quite constantly present. In those with pneumonia all of the usual organisms invading the respiratory tract have been found, including the various types of pneumococci, streptococci, Friedlander's pneumobacillus and even staphylococci. It is also pointed out that the pneumonia is not of the usual lobar type but a bronchopneumonia without definite areas of consolidation, absence of the usual fibrinous pleural exudate, extreme wetness of the lung, and blood-stained pleural fluid. Recent investigations have not much changed the belief cited as to the etiologic importance of Bacillus influenzae. Bloomfield (Bull. Johns Hopkins Hosp., March 1920, p. 85) showed that "influenza bacilli quickly disappear from the normal mucous membranes of the mouth, nose and pharvnx after the introduction of a pure culture on the tongue, on the pasal septum, or into the nasopharynx." Pfeiffer's bacillus is apparently not specific for influ-

enza, as it is found in more than half of all cases of mild respiratory infections when influenzal symptoms are not present, although it may cause some associated symptoms in the condition. This bacillus has been found in the noses and throats of patients with acute lobar pneumonia, and Stillman (J. Exper. Med., January 1922, p. 7) refers to the frequency of this organism in cultures taken from normal persons. Two types of carriers of the influenza bacillus have been found, those who have recently had the disease and those who are apparently immune and are not affected by this germ. The condition of the mouth and throat must determine whether these germs can live or not. This bacillus has been found in pneumonic sputum, in the pleural fluids, and in the blood after death. Pfeiffer (J. A. M. A., Aug. 30, 1930, p. 674) defended the pathogenic rôle of the bacillus that he discovered. He stressed that the bacillus is extremely widespread but it must not be confounded with numerous similar species. Nevertheless, Pfeiffer admits that the etiology of influenza is still obscure, and it remains to be explained why

this bacillus, which is common everywhere, becomes virulent only during periods of epidemics. Wolbach and Frothingham (Arch. Int. Med., October 1923, p.

571) conclude from their study of the epidemic of influenza at Camp Devens in 1918 that the influenza bacillus is one of the secondary invading organisms in these cases, that a virus causes the epidemic, which virus further causes degeneration of muscles and especially affects the suprarenal glands. Brannan and Goodpasture (Arch. Int. Med., December 1924, p. 739) studied influenzal pneumonia during an interepidemic period, and believe that the influenza bacillus is an important agent in the production of bronchial pneumonia; that this bacillus is associated with pneumococcus or other bacteria, and that "it produces characteristic lesions in the lungs, essentially a bronchitis, ulcerative bronchiolitis, and bronchopneumonia with a tendency to chronicity and to the formation of bronchiectatic abscesses," They also consider the influenza hacillus as a secondary invader of the lungs.

According to A. Eichhorn and N. J. Pyle (J. A. M. A., June 23, 1934, p. 2082) the virus of influenza in man apparently induces an immunity in ferrets against the distemper virus of dogs. The available experimental data susgerst a possible relationship of

influenza in man and distemper in dogs.

That some immunity is caused by one visitation of the disease seems to be unquestionable. How long this immunity lasts is doubtful. Some persons have the disease annually for several years, though they rarely have it twice in the season. After an epidemic, the decreased number of excerning the following year seems to represent a securing the following year seems to represent a few of the district of the decrease of the property of the decrease for the present as the district of the decrease of the decreas

Vaccines have now long been used and advocated to previous tracks of influenza and of colds that predispose to this disease, but their action is so doubtful that the influenza bacillus is generally combined with several types of the pneumococcus, with Micrococcus caterarhalis, often with the Streptococcus hemolyticus, and sometimes with Staphylococcus aureus and Staphylococcus albus. The value of these mixed vaccines is doubtful.

The incubation period of influenza is uncertain; it may be only one or two days, or longer if there is resistance to the germ or more or less immunity.

#### GENERAL PROPILYLAXIS

The measures advised for prevention of influenza, in hireli, include: Staying away from crowds; isolation of the sick when feasible; avoidance of hand to mouth infection; the wearing of a suitable face mask by those in immediate attendance on the sick to ward off infection from the patient sneezing or coughing into their faces, a thus infected mask being immediately removed and disinfected or burned; plenty of sunlight and fresh air; the avoidance of dampness and undue exposure to the elements; early rest in bed in a tworn room during the first stage of the disease. In addition, the usual precautions attendant on acute infectious diseases should be emoloved.

#### SVM PTOMATOLOGY

The small blood vessels all over the body seem to dilate and produce capillary congestion, especially of the mucous membranes, the most frequent result being coryza, pharyngitis, laryngitis or tracheitis. The congestion in the larvnx causes the harsh, dry, metallic cough which is quite characteristic of this type of influenza. The congestion and swelling of the mucous membrane of the trachea cause a peculiar oppressed feeling with more or less pain, referred to the upper part of the sternum. The great amount of sneezing which occurs with a typical attack, almost similar to that of hay fever. is due to congestion of the mucous membrane of the The conjunctivae may also be injected, causing pain in the eyeballs and often a conjunctivitis, another typical symptom of influenza. In some seasons there seems to be a special tendency to middle ear inflammations. At other times there frequently occurs a congested ear drum, with sometimes a hemorrhagic bleb or vesicle on the drum, a very painful though easily remedied condition.

The almost constantly present lumbar backache at the onset of this disease is possibly due to congestion of the kidneys, and albumin is frequently found in the urine of such patients, and occasionally blood corpuscles. There are generally muscle pains, especially on the sides and back, and deep breathing is often painful. Menorrhagia or metrorrhagia may occur from the same tendency to dilatation of the blood vessels. There may even be nosebleed, and occasionally slight hemoptysis without any other assignable cause and without any subsequent development. With this disease, although the fever may be high, the skin is likely to be moist, and there may be profuse perspiration. The pulse may be slower than is normally expected from the height of the fever, and the blood pressure is generally lowered. All these conditions are due to the tendency of the blood vessels to dilate and to depressor of the suprarenal glands.

Rosenow believes that the leukopenia in influenza may be due to peculiar properties of the bacteria which are now generally regarded as secondary invaders. He believes that this leukopenia in influenzal conditions predisposes to influenzal pneumonia and causes a grave prognosis. Typical influenzal pneumonia shows diffuse physical signs in both lungs, with a leukocyte count generally below 10.000 and a differential white count showing a relative deficiency in neutrophils. Something seems to interfere with the normal reaction to the pneumococcus, as lobar pneumonia rapidly shows a leukocyte count above 12,000, with the neutrophils from 80 to 90 per cent in the differential count. C. H. Bunting (Am. J. M. Sc., July 1921, p. 1) found that in uncomplicated influenza there was "an early neutrophil leukocytosis followed by a rapid drop to a leukopenia, with a marked deficiency in the cells of marrow origin and of blood platelets and with a lymphocytosis of varying degree." Even when the symptoms of the attack abate, the blood count may still be abnormal. This leukopenia would seem to indicate that the infection is not of pyogenic coccus origin.

The heart is generally weak from start to finish in this disease, and collapse from this cause may occur suddenly. As emphasized by Daland (M. Rec., Jan. 31, 1920, p. 173), there is depression of the suprarenals with the influencial infection. Therefore, coal tar drugs should not be given, excepting in small doses, and never long continued, not even acetylaslicylic acid. Nor should

other depressant drugs be administered. Underhill (J. A.M. A., Dec. 4, 1930, p. 1531) called attention to the fact that the blood in influenza is greatly concentrated, and that this is an important factor in fatal cases. Consequently, in serious conditions the blood concentration should be determined by hemoglobin estimations, and, if found much increased, fluid should be given intravenously.

Not infrequently the disease seems to affect the bowel; this can occur with or without respiratory catarrhal symptoms. Patients so affected have diarrhea, with more or less intestinal irritation, apparently the greatest amount of dilatation of blood vessels in these cases occurring in the mucous membrane of the intestinal tract

The term gastro-intestinal influenza is still somewhat vaguely used. There is no evidence that sporadic outbreaks of disease in which intestinal symptoms predominate are due to the infectious agent that causes true pandemic influenza. Many of the occasional outbreaks called "intestinal flu" and similar names have been shown to be various types of gastro-enteritis caused by paratyphoid bacilli and similar organisms. In such an instance as the outbreak of gastric and respiratory influenza reported by Thomas McGowan in Glasgow (M. Officer, Sept. 12, 1931, p. 115) no convincing evidence is presented that the outbreak was really influenzal in nature. An interesting possibility is suggested by C. C. McLean (South. M. J., July 1931, p. 624), who believes that the disease known as intestinal influenza in certain localities is a definite entity of unknown etiology. It is certainly true that up to the present no definite relation between such outbreaks of gastro-enteritis and influenza has been established.

The future of every patient with influenza is prostration and nervous and muscular debility, with more or less circulatory weakness; in other words, there is exhaustion. The patient's resisting power is reduced, and any defect or diseased condition that he may have is aerravated by this disease.

If no complications occur, the convalescent patient should rest as much as possible, should not be subjected to exposure and should be given tonics. If necessary for a short period at least, some hypnotic, or some physical method should be employed to cause sleep.

Complications.-The most frequent complication of influenza is pneumonia. The type of pneumonia that follows influenza generally is the lobular or bronchial pneumonic type; pneumonic congested areas may be found in different parts of one or both lungs. Not infrequently, however, true lobar pneumonia occurs, In the pneumococcic type pleurisy is rare, but with the streptococcic type pleurisy was frequent during the epidemics, often with pockets of infection and abscess of the lung, and empyema was not unusual. Recovery from influenzal pneumonia is always slow. Postinfluenzal bronchitis is a frequent complication which is sometimes helped by autogenous vaccines. Abscesses in the lungs or elsewhere are found to be due to Streptococcus hemolyticus or Staphylococcus aureus, Abscess of the lung may not need an operation if posture helps evacuation of the pus. The proper treatment for empyema following influenza or streptococcic oneumonia has been much discussed. The present tendency is to delay surgery as long as possible. Inflammation of the ear is a frequent complication.

The various sinuses in the region of the nostrils may become affected; all types of indigestion may occur, and not only sleeplessness and meningismus, but also serious meningitis. Mental depression is common, following severe attacks of grip. Rivers (Am. J. Dis. Child., August 1922, p. 102) reviewed 197 cases of influenzal meningitis of which 79 per cent occurred in children under 2 years of age. The mortality in 220 cases was 92 per cent. This influenzal meningitis of children he says appeared in most instances to be "a primary disease produced by a group of influenzal bacilli." Schroeder (Am. J. Dis. Child., March 1920, p. 231). reviewing influenza, found that few cases of meningitis were due to the influenza bacillus, although two types of disturbances of the nervous system have been noted, one a meningeal form and the other a convulsive or eclamptic form. There have been a number of case

reports showing improvement or remission in cases of epilepsy and other mental diseases following influenza. On the other hand, encephalitis seems to occur frequently following influenzal epidemics. Pyelitis may occur, probably from some focal infection. Pericarditis, myocarditis and endocarditis occur as complica-

tions of influenza.

As the heart is often affected in influenza, depressant drugs should be given with great care, especially as in this disease the heart may be weak from start to finish and require supporting treatment. Albert S. Hyman (J. A. M. A., April 12, 1930, p. 1125) asserts that post-influenzal angina pectoris must be considered as a not uncommon sequela in the convalescence from influenzal infections occurring in the middle aged. Of 412 patients with acute influenzal infection whom he observed, in 9 angina pectoris developed although they had never had symptoms of the disease before. Postinfluenzal debility should be recognized as the probable result of some focal infection, or continued lung infection, or tontinued lung infection, or the beginning of some tuberculous process which is perhaps at first concaled.

It should be emphasized that many secondary infectious processes, especially those occurring with influenza and pneumonia, are due to foci of infection in the mouth. Dead and infected teeth carry germs which the person, when otherwise well, may withstand. When such an infection as influenza weakens the heart and the suprarenal glands, these germs cause more or less

general infection.

# TREATMENT

When it is suspected or has been determined that a patient has influenza, it is most important that he remain in bed. It is quite essential that he be isolated and that care be taken that he does not spread the discase by the spray from coughing or sneezing, and that he does not use the same towels, napkins, drinking-cups and eating utensils as other members of his family. The patient should be prohibited from fondling and kissing children. If the patient is a young child in dose contact with the mother or nurse, all other possible precautions to prevent contagion should be taken.

Each family should be taught that grip is an infection, that it is contagious, that it spreads rapidly, that it may have serious complications and that it frequently leads to pneumonia, which has become in many regions of this country the most frequent cause of death. Whether a school child has symptoms of an acute cold or influenza, he should be sent home and remain there until he is well.

As a patient with grin is liable to have a chill, or at least to feel chilly or have cold sensations up and down the back, anything that makes him warm improves his condition. He may be given hot malted milk, hot tea or hot lemonade, at more or less frequent intervals, until his chilliness has ceased. The patient may be given a hot tub bath and then put into a warm bed in a warm room as an efficient means of making him comfortable and relieving the internal congestion. Hot water bags or an electric pad at the feet and extra covering to the bed are often needed. A quickly acting stimulant is camphor, given in tablespoonful doses of the official water (aqua camphorae), in lemonade, every two or three hours. The various methods suggested for aborting an acute cold may be used in this disease. Much greater care must be exercised, however, if the patient has an influenza infection than if he has a simple cold, as to when he can return to his work or occupation, or be subjected to exposure to cold or dust, either in a house, building or outdoors.

The temperature quickly rises and is often quite high, associated with severe headache, backache and irregular pains in other parts of the body. At this time a drug such as antipyrine, acetphenetidinum, or acetylsalicylic acid will be of benefit, provided that the dose is small; that the patient is not ambulatory, and that he is not to be subjected to exposure. With this depressing infection, such treatment is not wise unless a patient is

in bed, or at least remains in the house.

None of these drugs should be long continued even in small doses. Should depression occur after one of these drugs has been administered, or from the disease, circulatory stimulants such as camphor or caffeine should be given and the patient surrounded with dry heat. A hypodérmic injection of strychnine sulphate, 1/30 grain (2 mg.), may be given to stimulate the nerve centers. The following prescription is suggested:

B Acetphenetidini ... 150 āā gr. xxv Phenylis salicylatis ... 150 M, et fac chartulas 5.

Sig.: A powder every three hours.

A combination of acetylsalicylic acid, camphor and powder of ipecac and opium will sometimes be found of value .

	Gm. or Cc.	
Ŗ	Ac. acetyl. salicylic	gr. xv
3.6	Pulv. ipecac. et opii 1	gr. xv

Sig.: A powder every three hours.

When there is much irritation of the throat, gargles of salt solution and mild alkaline solutions are useful. If there is pain or headache suggesting involvement of the nasal sinuses, sprays containing epinephrine 1: 10.000 will often give relief by contracting the congested tissues and allowing the escape of retained

secretions. Little food is needed during the first twenty-four hours of grip, and it should not be pushed even on the second day, if food is repugnant to the patient.

He should have plenty of water and such simple liquid nourishment as he desires. As soon as the appetite returns, food should be pushed. The various catarrhal conditions should be treated as suggested in the discussions of corvza, pharyngitis and bronchitis. The patient must be kept warm, but it is necessary too that he have good fresh air and sunlight in his room. This is essential with all infections, and especially with infections of the nose, throat and lungs. The bowels should be treated as indications require. Simple laxatives may be given, if needed, or bismuth subcarbonate, if there is intestinal inflammation. Phenyl salicylate has been found beneficial, if there is much fermentation in the bowels, or Bacillus acidophilus and lactose may be given for a few days.

## USE OF DIGITALIS

Herrick maintains that in his experience the remedy of greatest value was digitalis. Without waiting for alarming indications of failing heart to develop in the way of feeble tone, rapid action, arrhythmia or dilatation, one should give digitalis by mouth in the dose of 1 grain (0.06 Gm.) of the leaf, two or three times a day, until the heart is stronger or until the fever process makes it unwise to continue this drug, owing to the effect of infections on the heart muscle. Epinephrine, given intramuscularly is of great value in heart weakness in influenza. Strychnine is frequently indicated and is of value. It should be noted that influenza is markedly depressant to the suprarenal glands, hence the great prostration.

#### CONVALESCENCE

Some form of iron should generally be given in convalescence and possibly a bitter before meals. If the patient is not nervous, a small dose of strychnine three times a day is good treatment. On the other hand, strychnine stimulation is overdone, and a patient who strychnine stimulation is overdone, and a patient who cannot sleep should on the given strychnine later than the noon meal. As has already been pointed out, focal infections in the patient salready been pointed out, focal infections in the patient to structure of the structure of the patient such as a to use the patient such as a structure of the stru

The management of influenza should be as rational and simple as that of a case of typhoid. The use of drugs should be entirely symptomatic, and when they have served their purpose they should be discontinued. In the article on pneumonia which follows will be found further information as to the treatment of the pneumonia frequently seen following influenza.

## EPIDEMIC HICCUP

Epidemic hiccup seems to develop during mild influenza epidemics, and the cause may be closely associated with the cause of that disease. The large majority of cases are among adults, although a few children may be affected. Males seem more susceptible than females, at least in certain epidemics. Associated with persistent hiccup are often nausea and vomiting and sometimes muscle pains, especially through the trunk. The hiccuping period varies from a few hours to several days, and in rare instances lasts more than a week or two. the average duration being about four days. Although there may be cases of colds in the same family with the patient who is attacked with hiccup, rarely do more than one member of the family show this symptom. Sometimes unexplainable cases of nausea occur without the hiccup.

The treatment is sedatives to the stomach, as bismuth and soda or milk of magnesia, hot water, and bromides. Alkalis sometimes are of benefit, and sometimes atropine is useful. Some brisk purgative is generally advisable. If the hiccuping is severe and becomes serious, morphine

must be given hypodermically.

Griggs (Northwest Med., December 1929, p. 557) treated eight cases of epidemic hicup by quinine and urea hydrochloride, 7½ grains (0.5 Gm.), into the buttock. C. Weelsc / Jins. Surg., April 1931, p. 801), believes that in intractable hicup, if all the usual methods of treatment fail, the patient should be examined fluoroscopically to determine which side of the diaphragm is involved. The phrenic nerve on the side involved should then be exposed and anesthetized or avulsed if necessary. If 5 this sides of the diaphragm are involved, both nerves should be exposed and blocked either temporarily or permanently.

#### PNEHMONIA

Pneumonia is today the most serious acute infectious disease confronting the physician, even surpassing tuberculosis among the acute infectious diseases as a cause of death. It attacks suddenly and kills quickly.

Occurring usually in endemic form, it also appears frequently in epidemic form, and has become one of

the most threatening of diseases.

In outlining a plan of procedure to follow in the prophylaxis and treatment of pneumonia, it is essential to have clearly in mind the causation and natural course of the disease. Pneumonia, or inflammation of the lungs, includes acute lobar pneumonia as well as various forms of atvoical and bronchoneumonia.

# THE INFECTING ORGANISM

Acute, lobar pneumonia, due to infection by the pneumococcus, usually runs a rapid course, and is characterized by a diffuse exudative inflammation of large parts of one or more lobes of the lungs. Bron-chopneumonia, on the contrary, may be due to a variety of bacteria, but usually streptococci are found. In fact, most cases of pneumonia which follow or complicate contagious diseases are due to streptococci, i. e., are septic pneumonias.

In pneumonia following influenza the clinical and pathologic picture is that of a streptoxocus bacterenia, with metastases in the lungs, joints, kidneys, serous surfaces, gallbladder or appendix. The prominent gross pathologic lesions are extensive hemopurulent pleuritis and pericarditis, marked hyperplasia of the lymph glands, and parenchymatous degeneration of kidneys, liver and myocardium. Usually the lungs are only partially consolidated, heavy and pliable. Often much of an entire lung may be involved. These cases correspond to those frequently observed complicating diphtheria, scarlet fever or measles. The cases of pneumonia which occurred so extensively in connection with epidemics of measles in training camps were in large part of this sort.

While we have been in the habit of saying that lobar pneumonia is caused by the pneumococcus, recent studies have shown that strains of pneumococci, which are alike so far as cultural properties are concerned, are still widely separated in their biologic qualities.

When the study of pneumonia was undertaken at the Hospital of the Rockefeller Institute, a large number of strains of pneumococci were isolated and studied as to their immune reactions. Animals were immunized to each strain, and the blood serum of each immune animal was then tested as to its power to agglutinate each of the strains, and also as to its power to protect mice from infection by each. As a result of these studies the strains of pneumococci grouped themself into four classes or types. The serum produced by immunizing with each member of a group acted in a similar manner on all the strains of the group, agglutinating the bacteria and protecting mice against infection. On the contrary, the serum produced by immunizing with a member of one group had no such power over the strains of the other groups. The four groups of pneumococci are spoken of as types I, II, III and IV. Type I is found in 33 per cent of cases of lobar pneumonia; type II in 29 per cent; type III in 13 per cent, and type IV in 20 per cent. The pneumococci found normally in the mouth belong to type IV.

Recently G. Cooper et al. (J. Exper. Med., March 1929, p. 461) subdivided the various strains of pneumococci that comprise group IV into a considerable

number of specific types.

The prevalence of various specific types of pneumococci has been determined in 582 family contacts of actual cases of lobar pneumonia and also in 493 controls by W. G. Smillie (J. A. M. A., Oct. 21, 1933, p. 1281). Cooper's classification of specific types of pneumococci-up to type XX-was used. Type I and type II pneumococci were found to be much more prevalent in the nasopharynx in immediate family contacts of cases of lobar pneumonia, due to the homologous type, than in the population at large. The higher types of pneumococci-types III to XIX inclusive-were just as prevalent in the throat in the general population as in the family contacts of cases of pneumonia due to these specific types. The types most frequently encountered were III, VI and XVIII. The whole group of pneumococci were less prevalent in the late summer months than in the winter and early spring. Poor economic conditions with resultant overcrowding did not per se increase the prevalence of any one specific type of pneumococci in contacts of pneumonia due to the homologous type.

Focal infection in the teeth and tonsils must predispose to, and aggravate, a pneumonic infection of the lungs, especially the bacteria of the streptococcic and pneumococcic groups. W. A. Price (Dental Infections: Oral and Systemic, Cleveland, Penton Publishing Co., 1923) and E. C. Rosenow (Ann. Clin. Med., January 1923, p. 211) have shown the seriousness of such focal infection. Perhaps types III and IV pneumococci may cause pneumonia in a carrier, but it seems that types I and II pneumococci cause pneumonia from some external source. The type of the pneumococci in evidence is ascertained from swabs taken from the widence is ascertained from swabs taken from the

throat.

According to W. D. Sutliff and Maxwell Finland (J. A. M. A.), Oct. 21, 1933, p. 1289) a general survey of the incidence of twenty serologically specific staphylococci, and Friedlander badili in the pneumonia cases in a general hospital in an interepidemic period shows that each one of these organisms may cause the disease. The rare type-specific pneumococci, numbered from IV to XX, are consistently present in the sputum and lesions in certain cases of lobar and bronchonneumonia. The presence of such pneumococcus strains in the sputum of patients with pneumonia is a reliable indication of their presence in the lung. Exact etiologic diagnoses of pneumococcic pneumonia were made by the use of seventeen of the new typing seruns, in a group of case in which this has heretofore been impossible, amounting to 30 per cent of the total number of lobar pneumonia cases and in 65.1 per cent of the relatively little understood and important group of bronchopneumonia and secondary pneumonia.

The order of frequency of the six most common pneumococcus types in pneumococci lobar pneumonia is as follows: I, II, III, VIII, V and VII, making together, 84.1 per cent of the cases; and the order of occurrence of the ten most frequent types in pneumococci bronchopneumonia is: III, VIII, XVIII, XV, II, XI and XIV, making altogether, 81.1 per cent of the cases. The six types most frequent in lobar pneumonia are also those most frequent in the whole series, and have been given more attention than the others.

The three most frequent of the newer types are V. VII and VIII. Type V makes up 5 per cent of the total of pneumococcic pneumonias or empyemas, and causes either pneumonia or empyema in 96 per cent of the cases in which it is found and leads to purulent complications in 28 per cent of the pneumonia cases. Type V is associated with lobar pneumonia rather than with bronchopneumonia in only 81 per cent of the cases, in which respect it resembles most of the newer types. The distribution according to age is quite irregular and without the usual preponderance in middle life. Type VIII is associated with pneumonia or empyema in only 80 per cent of the cases but leads to purulent complications in 11 per cent, a rather high proportion of these pneumonia cases. Type VIII is associated with pneumonia or empyema in 90 per cent of the cases in which it is isolated, and has a low mortality in lobar pneumonia, 23.8 per cent, but owing to an average bronchopneumonia mortality of 67 per cent has a total mortality near the average.

The experience afforded by the bacteriologic classification of this series of pneumonia cases indicates that the pneumonias due to different serologic strains of pneumococci and due to other organisms may be regarded as separate entities. By identifying such organisms in every case the clinician may make accurate

etiologic diagnoses and prognoses.

Chilling with the opportunity for infection is a predisposing cause of pneumonia. Acute colds and bronchitis predispose to postoperative pneumonia after an anesthesia which may cause atelectatic areas in the lungs. Also, as just stated, infected mouths and carriers of Streptococcus hemolyticus and of pneumococci may be the cause of such postoperative pneumonia. After there anesthesia, chilling of the patient should be avoided. In the beginning of pneumonia in children the symptoms may be almost entirely abdominal, and may even suegrest an appendicitis.

These studies have an important bearing on the prophylaxis and specific treatment of lobar pneumonia. By making use of the serum of animals which have been immunized against cultures of the four types of pneumococci, it is possible to test the strain from each case of pneumonia and to place it under the type whose corresponding serum causes it to be agglutnated. This is important if immune serum is to be used, as the only cases of pneumonia which are benefited by serum are

caused by organisms of type I.

In 448 cases studied in the Hospital of the Rockefeller Institute, 145 were of type I, 148 of type II, 55 of type III and 100 of type IV. Of these cases, pneumococci were found in the blood in 136 instances. The mortality when the organism was found in the blood was 55.8 per cent, whereas in the 312 cases giving negative blood cultures, the mortality was only 8.3 per cent. This shows that the presence of the pneumococcus in the blood during lobar pneumonia indicates a severe infection and a bad prognosis.

Developments along several distinct but parallel lines lend strong support to the conception of the association of atelectasis and pneumonia. Evidence from many surgeons and anesthetists, according to Yandell Henderson (J. A. M. A., Feb. 14, 1931, p. 495) demonstrates that attelectasis frequently occurs after abdominal operations and is the origin from which postoperative pneumonia develops. By the prevention of postopera-

tive atelectasis in clinics in which the prophylactic inhalation of carbon dioxide after every operation has been adopted as a routine, postoperative pneumonia has been relegated to the class of preventable and prevented diseases. Henderson suggests further that the pneumonia associated with carbon monoxide asphyxia and asphyxia of the new-born is of similar origin.

#### GENERAL CONSIDERATIONS

Although pneumonia has been considered a selflimited disease tending to recovery, this can hardly be said to be generally true. The sthenic type of pneumonia which does tend to recovery, with one or more lobes distinctly involved, is now not so frequent as a less circumscribed pneumonia, or as an asthenic type with a low temperature and without much tendency to self-limitation and, as the statistics show, not a great tendency to recovery. The crisis which should introduce recovery means, according to Hektoen, the destruction of the pneumococci in the lungs and blood. This, he says, is accomplished by phagocytosis and by extracellular digestive processes. Therefore, the greatest defense against pneumonia is a production of leukocytosis and of antibodies in the blood. Such patients as rapidly die of a toxemia do not have this blood defense in sufficient amount. When this defensive process has been produced in sufficient amount to destroy the pneumococci rapidly, the recovery is by crisis; when it is in sufficient amount to destroy them only slowly, the recovery is by lysis. The latter form of recovery is the one that we now see most frequently.

H. A. Reimann (J. Exper. Med., October 1924, p. 533) studied the blood platelets in pneumococcus infections and found that they began to diminish after the infection has become established; that they are diminished during the febrile stage, and that they began to return to normal after the crisis or after the temperature begins to fall by lysis. During convalescence the platelet count may be above normal. While the average normal count is 350,000 platelets per cubic millimeter, he found that in the uncomplicated cases of lobar pneumonia, the number ranged from 125,000 to 243,000. In fatal cases, the platelet count was very

much lower, even below 100,000.

C. Lundsgaard (Ugesk. f. læger, July 10, 1924, p. 527) studied the oxygen content of the arterial blood in 50 patients with croupous pneumonia and in 14 with influenzal pneumonia; he found that all patients with pneumonia have a greatly diminished oxygen content of the blood. Therefore, they have to fight an anoxemia as well as the infection. R. L. Cecil (Am. J. M. Sc., July 1922, p. 58) urges more careful bacteriologic study of the sputum and the typing of the pneumonic germ when present. If type I is found, he recommends the antiserum for this germ. If Streptococcus hemolyticus is found, he urges the physician to watch for abscess and empyema, while if Streptococcus viridans is the prominent bacterium, he thinks that the prognosis is excellent. With the influenza bacillus in large amount slow resolution will occur, and chronic bronchitis and sometimes emphysema and bronchiectasis may develop. If the recovery of the patient is slow, a search for tubercle bacilli should be made. Cecil notes that in relapses in pneumonic or other lung inflammation, retyping is necessary, as another germ may be the cause of the secondary symptoms.

David Riesman (J. A. M. A., April 19, 1924, p. 1256) contends that pneumonia is often overlooked, especially postoperative pneumonia, because the symptoms are not positive. There may be little if any cough, and no pain, and perhaps not much fever or increased respiration. The pneumonic lesion is likely to be posteriorly placed, and unless the patient is carefully examined both anteriorly and posteriorly, the consolidated area will at first be overlooked. He believes that lobar pneumonia is more common in infants than the textbooks teach, and finds that the pneumonia following measles is often lobar. He also notes that abdominal pain and vomiting may be prominent symptoms in neumonia in the child

#### PREVENTION

It has generally been considered that many persons harbor the pneumoscous in the mouth and throat, and that it is thus ever ready to attack the person who becomes debilitated, and especially to add its attack to that of influenza or to follow a streptococal infection of the throat or nose. There is no doubt but that exposure and weakening of individual resistance play

a prominent part in the development of the disease. Recent studies of the presence of the various types of pneumococci in the throats of normal persons, in the throats of those suffering with pneumonia, and in healthy persons in contact with cases of pneumonia, as compared with those not in contact, and in the dust of rooms in which lobar pneumonia had not occurred, as compared with the dust of rooms in which cases of pneumonia had not occurred, as compared with the dust of rooms in which cases of pneumonia had not curred, all show that pneumonia, in a considerable proportion of cases at least, arises chiefly by infection from without. It was shown definitely that pneumococci of types I and II are practically never found except in the environment of persons ill of the disease or in the environment of carriers.

Therefore it seems advisable to regard every case of pneumonia as a focus for the spread of the infection, and the same measures for the prevention of infection of others should be instituted as have been found efficacious in other communicable diseases. These include primarily (a) isolation of the patient, (b) collection of the sputum in special containers and its disinfection, and (c) sterilization and prevention of contamination from utensils, bed-clothing, personal clothing, handker-chiefs, and other material in close contact with the

natient.

The physicians, orderlies or nurses in attendance on patients with pneumonia should practice the greatest care in order to avoid transmitting the disease te others. This involves the wearing of a clean gown when attending patients, the thorough cleansing of the hands with soap and water before and after attending each patient, and, as has been suggested by Weaver, the wearing of a simple protective face mask when in attendance on patients. This not only safe-guards the physician or other attendant from spraying from the sneezing or coughing of the patient, but also prevents the patients from becoming infected through their attendants with secondary infections by organisms which they do not already have.

The room of the patient with pneumonia should be kept as clean as possible, and after the patient's recovery it should be thoroughly aired, washed and sunned to

kill any remaining organisms.

Cases of the common contagious diseases, such as measles and scarlet fever, in which secondary pneumonia occurs, should be isolated and not allowed with uncomplicated cases.

Cecil (Medicine, November 1924, p. 395) insists that recovery from an attack of pneumonia gives the patient a high immunity against the particular type of pneumococcus with which he was infected. He also believes that the pneumococcus vacine, when given in adequate doses, confers immunity against pneumococcus pneumonia. He states also, however, that one of the indications for the pneumococcus vaccine is to prevent recurrence in persons who are highly susceptible to

repeated attacks of lobar pneumonia.

W. H. Park (M. J. & Rec., Nov. 4, 1925, p. 531) reports that in New York City about half the cases of pneumonia are due to type I pneumococcus, about onethird are divided between types II and III, and the rest are due to type IV. The last type is a mixture of many types of pneumococci against which it is not possible to immunize. He maintains that vaccines can be given to protect against types I, II and III, which comprise from two thirds to three fourths of the cases, and that "a pneumonia vaccine is a perfectly sensible thing to give, but hardly a public health measure to urge. vaccines are best administered subcutaneously, as intracutaneous injections may cause severe local reactions. Three injections are given at seven day intervals. These pneumonic vaccines should not be given when any acute disease is present or when there is chronic heart or kidney disease, and they probably should not be given during pregnancy.

# CARRIERS

A search should be made for pneumococus carriers of the organisms of types I and II specially, and these carriers should be instructed as to the prevention of the spread of the organisms. They also be provided with a disinfecting mouth wash or gargle, and should use it persistently until the organisms have disappeared from the nose, throat and bronchial secretorions.

Kolmer and Steinfield refer to the studies of numerous observers who have shown the high pneumococcidal activity of ethylhydrocupreine hydrochloride and of quinine preparations. They studied the possibility of disinfecting the sputum and the mouth with such preparations. For washing the mouth and gargling, a solution is conveniently prepared according to the following formula:

Gm. or Cc.

B. Ethylhydrocupreine hydrochloride or quinine bisulphate 02
Liquor antisepticus N. F. 20
Distilled water to make 200

# GENERAL TREATMENT

1. Rest.-The patient's rest should be as nearly perfect as possible. Not only should the room be situated to get the best fresh air and sunlight, but it must also be kept quiet. It is often desirable that such patients receive hospital care and attention. If transfer to a hospital is to be made, the patient should not be allowed to stand, but should be moved with the least possible exertion to himself. Friends and relatives should not disturb the patient. Sleep and a quiet heart are more essential in pneumonia than in almost any other disease. Perfect rest does not mean that the patient should not be turned frequently, or that at times he should not have several pillows. It must be emphasized that the circulation in the lungs should be changed by alterations in position. A patient with pneumonia should not lie flat all the time. Hypostatic congestions readily occur with pneumonia, especially if the heart's action is impaired.

The daily sponging for cleanliness should be gentle,

and cause the least possible disturbance.

2. Fresh Air.—It has now long been demonstrated that a patient with pneumonia has less fever, a slower pulse and a better blood pressure, and that he breathes less rapidly in cool, clean air than in close house air. Wards on the roof are most valuable for hospitals in the treatment of pneumonia. The balcony, veranda, or even tent treatment of pneumonia is advisable at certain seasons of the year with certain types of patients, when such facilities are obtainable. It is always essential that the room of a patient with pneumonia should have more than one window—the more the better—and that these windows should be open, except when

the patient is being bathed or his clothing is being changed. Under no circumstances is it wise to have a draft of cool or damp air blow directly over the patient's face, but screens can be used to modify the direction of the wind or brisk air. Very young children and old persons should not be subjected to severe cold atmosphere, but older children and strong adults not only may endure cold but may even thrive in it. The fresh air or outside air treatment of pneumonia is subject to the modification of common sense. If a patient's body and extremities become cold or chilled when properly covered, the fresh air treatment is too severe.

3. Diet.—The food should represent something of all the elements required for nutrition. This means protein in the form of egg, meat juices, properly prepared meat broths and milk. The eggs may be in any form desired, except fried. The milk should never be sufficient in amount to cause intestinal pas or

gastric indigestion.

The next necessary element for nutrition is starch, and it should not be forgotten that many a seriously ill patient may die of acidemia from carbohydrate starvation. Egg albumin and milk do not represent the proper food for patients for more than a few days. The starches can be obtained in cereal gruels, rice, oatmeal, malted milk, toast, crackers, and even by potato soup. Ice cream, custard, chocolate, and a small amount of sucrose or lactose are all for value.

The patient should be allowed plenty of water. Unless there are edemas from a failing heart or from kidney insufficiency, water will increase the amount of urnine and therefore remove more products of waste metabolism from the blood, thus tending to prevent the toxemia which is to be feared. Water promotes the secretion of the skin, which is desirable, and also renders the exudate in the lungs less tenacious and

more easy of expectoration.

Elements of nutrition which must not be forgottenare: sodium chloride, iron when meat juices are not given, and lime when little milk is given, and especially if there is much blood in the expectoration. The sodium chloride can be given by properly salting the patient's food, especially his gruels, and at times even his milk. The iron may be given as a sacharated oxide of iron, in a 3 grain tablet, crushed at the time of taking, or crushed by the patient's teeth, and administered twice a day. The lime may be given as lime water in tablespoonful doses in milk or in water, three or four times in twenty-four hours; or it may be given in a carsule as calcium lactate, in 0.4 Gm. doses.

As the chlorides of the blood are low, plenty of sodium chloride should be given the patient. Some of the dyspnea may be due to a mild acidosis, and this may be combated with sodium bicarbonate both by mouth and by rectum. However, care should be taken that alkalosis is not caused and that a diminished alkalinity of the blood is actually present before the

sodium bicarbonate is given.

The whole question of the diet is also subject to common sense modification to fit the patient. There are enough suggestions in the foregoing to furnish sufficient nutrition while meeting almost any patient's desires. The main object is (1) to avoid depriving the patient of any element that he requires to promote metabolism and keep up nutrition, and (2) to avoid gastric and intestinal indigestion. If the tongue is heavily coated and the patient is so seriously ill that he does not digest food properly, 5 drops of dilute hydrochloric acid in water, directly after the protein meals, will aid digestion in the stomach and often clean the tongue. It may also stimulate intestinal digestion. If there is much intestinal gas, the diet should be closely studied to ascertain which food is causing it. Provided the blood pressure is not too high, the heart not too irritable, and the patient not too nervous and restless, coffee morning and noon, or coffee in the morning and tea at noon, or tea both times if the patient prefers, is advisable and often beneficial. Tea and coffee should be considered as representing caffeine, and if the action of caffeine is desirable, these beverages may be given. They should not be given in the late afternoon or evening, as they tend to prevent sleep.

4. The Bowels.—The bowels should move daily. Constipation should be prevented, but diarrhea is not desirable. The cathartic preferred by the physician may be given in the beginning of the disease. Later, any preferred laxative, whether a cascara mixture or some other combination. may be given. An occasional

enema of glycerin and water, one-half ounce of each, will be found valuable. It will empty the colon and prevent the necessity of giving large doses of a laxative or a cathartic. Such treatment will aid in preventing

tympanites.

Diarrhea will weaken the patient and add one more element to cause weakness of the heart. If it occurs, the bowels should be cleaned out with a laxative, or by castor oil if it can be taken, and then movements should be prevented by one-tenth grain (O.06 Gm.) of morphine. Saline cathartics are likely to increase the amount of gas in the intestine, and hence are generally contraindicated. Bismuth is likely to remain too long in the bowels and promote the growth of germs and the absorption of toxins, which will add one more danger in the pneumonia toxemia that is constantly feared. Phenyl salicylate (salol) in 0.25 Gm. doses, in capsules, may be given four or five times in twenty-four hours for a few days to stop excessive fermentation. Acidophilus bacili or yeast may be of value.

5. Abdominal Distention.—The routine use of a daily morning enems of soap suds has been suggested to prevent this complication. If abdominal distention occurs, milk should be temporarily eliminated from the diet. A napkin or gauze soaked in olive oil, 3 parts, mixed with turpentine, 1 part, may be applied to the abdomen. This should be covered with flannels wrung out in hot water, the heat being retained by covering with a thick pad. The hot flannels must of course be renewed frequently, as needed. These may be continued until relief occurs. Following the application of the stupes, medicated enems may be

employed. The following is suggested:

This is followed in an hour by an ordinary soap suds

enema.
Frequently pituitary solution 1:10,000 in doses of

0.5 cc. given hypodermically may be effective.

6. Care of the Skin and Mouth.—It is rare, with the proper diet, the proper treatment of the bowels, and with plenty of fresh air, that the temperature in

pneumonia is so high as to require sponging. Even when the fever is very high, with a cerebral complication, tepid sponging in a warm room is as severe treatment as should be tried. Ordinarily, then, sponging once or twice a day with hot water is advisable, both for the comfort of the patient and to remove perspiration and keep the skin active. The temperature is more or less reduced by the warm sponging, the blood vessels of the surface are slightly dilated, the circulation is equalized, and the normal activities of the skin, which are essential, are increased. Also, warm sponging tends to relieve the tension of blood in the head, and many times aids in promoting sleep. If the patient's temperature is low, hot water sponging is certainly advisable, and hot water bags or electric pads should be used around the extremities and even around the body. Profuse, cold, clammy perspiration should never be allowed to remain on the patient's body. Warm, clean, pure alcohol sponging in such conditions is advisable, that is, sponging with undiluted alcohol. A dash of alcohol in a basin of water has no therapeutic or physiologic value, and represents nothing but a fad.

Frontal sinusitis and antrum trouble may be complications of pneumonia. It should be noted that not only in this disease but in influenza and in ordinary colds too much spraying of the nostrils may precipitate these conditions. Especially is it permicious for the nostrils to be dammed up with some of the so-called cold pastes. Unless there is purulent nasal exudate, it is advisable to leave the nostrils alone. Spraying interferes with the normal mucous membrane secretions.

Cleanliness of the mouth, teeth and tonsils is very important. The patient may have infected himself from his own tonsils or his own gums; such possibilities should be remembered, as well as the necessity of keeping the mouth as clean as possible during the illness.

# SERUM TREATMENT

As has already been stated, workers in the Rockefeller Institute have prepared antipneumococcus serums. The serums against infection with type I organisms appear to have produced especially good results, and to be highly effective in the treatment of cases of pneumonia due to this two of organism. The serum of type II is

much less efficacious and, indeed, it has not vet been thoroughly demonstrated whether it has any valuable effect on the outcome of the disease. The serum for type III organisms has apparently but slight therapeutic power, and has not been considered worthy of use in infections with this organism; the same is true of infections with type IV pneumococcus. Commercial preparations of these serums are available, as are also polyvalent serums. These polyvalent antipneumo-coccus serums are of extremely doubtful value. With pneumococci, at least as regards the first three types, the immunity reactions appear to be specific, and for this reason the workers in the Rockefeller Institute do not advise the routine manufacture of polyvalent antipneumococcic serums. In fact, they suggest that for the present, the production of antipneumococcic serum should be confined to type I. The first thing is to determine the sort of bacterium causing the pneumonia in the individual, and if it is a pneumococcus to determine the type to which it belongs. If it is a type I pneumococcus, serum injections should be given.

Albert B. Sabin (*I.A.M.A.*, May 20, 1933, p. 1584) states that the type of pneumococcus in lobar pneumonia may be determined directly from the sputum within a few minutes by a method which makes use of Neufeld's "quellung" phenomenon. Neufeld observed that when pneumococci are mixed with specific immune serum there occurs in addition to agglutination a "quellung" (swelling) of the peripheral zone of the

organisms.

Before the serum is administered, patients should be questioned as to previous injections of immune serums for diphtheria, meningitis or for tetanus infections, and also concerning previous symptoms suggesting asthma, hay fever, or special sensitivity to proteins, including those in serum. It is well to try the intradermal skin test, injecting first 0.02 cc. of sterile horse serum, diluted with salt solution 1: 10, with a control injection of a simple salt solution to learn whether or not the patient is especially sensitive to the serum. If sensitivity is present, the injection of the serum produces a large urticarial wheal surrounded by an area of ervthema.

Technic.—The scrum is injected into a convenient vein, usually at the bend of the elbow, the skin being previously cleaned with iodine and alcohol. If there are facilities for making blood cultures, blood may first be withdrawn for this purpose. The serum is injected into the vein with a syringe, or by the gravity method, the injection being done steadily and slowly, the injection of the first 10 to 15 cc. occupying from ten to fifteen minutes. During this time the patient is carefully watched for symptoms of reaction, such as increased rapidity of the pulse, difficulty of respiration, cyanosis or urticaria. If symptoms do not arise, the remainder of the injection may be completed in from ten to fifteen minutes.

Dosage.-The amount of serum necessary will vary in individual cases. The pneumonia antiserum for type l should be given intravenously in from 50 to 100 cc. doses every eight hours until the temperature falls. A serum for type II has been tried, but the results have not been satisfactory. Mixed serums of types I, II and III are available. It is said that this solution has a definite effect on type II pneumococcus, but it does not appear to have such an effect on type III pneumonia and has no effect on type IV pneumonia. The solution is supplied in 50 cc. containers suitable for intravenous injection. Capps and Coleman (J. A. M. A., March 17, 1923, p. 750) found antipneumococcus serum valuable for type I pneumonia. They also noted, as statistics have long shown, that alcoholic patients are had risks, and that even moderate drinkers are not as good risks as abstainers.

The effect on the prognosis of pneumonia in cases in which tobacco has been used excessively or in which there is serious mouth infection has not been studied.

The average total amount of serum required in cases and in the hospital of the Rockefeller Institute was about 250 cc. In many cases an elevation of temperature follows the injection of the serum within from twenty minutes to an hour, and this in turn is followed by a marked fall. If the temperature continues low and the patient's condition is good, no more serum is administered. The temperature is taken every two hours, and if it rises within twenty-four hours to 102 F. or more, a second dose of serum is at once administered.

If a fall in temperature does not occur following the first does, or if it does not fall to 102 F. within eight hours, a second does of serum may be given. The same rule governs the administration of the third or subsequent doese.

Contrary to the observations of many other clinicians, Kessel and Hyman (J. A. M. A., May 28, 1927, p. 1703), who gave 56 patients with lobar pneumonia the pneumococcus antibody solution, found that, except in a few cases, there was no evidence of specific thera-

peutic effect.

Oliver and Stoller (Arch. Int. Med., February 1925, p. 266) report that in their use of the pneumococcus antibody solution, they found less fever reaction when it was given subcutaneously than when it was given intravenously, although there was always a painful tissue reaction which persisted sometimes for days. They found the subjectoral region to be the most favorable site for these subcutaneous injections. Only 4 of 23 cases of pneumonia showed evidence of subjective and objective improvement. In these cases, the pneumococcus antibody solution did not sterilize the blood stream, and the authors found it of less value in type I pneumococcus infections than type I pneumococcus antiserum administered intravenously, On the other hand, Cecil and Larsen (J. A. M. A., July 29, 1922, p. 343) reported that in 424 cases of pneumococcus pneumonia treated with the pneumococcus antibody solution, the death rate was 21.4 per cent, while a control series of 410 cases showed a death rate of 28.3 per cent. This solution gave the most strikingly favorable action in pneumococcus type I pneumonia. They also found some advantage from this solution in pneumonia due to pneumococcus types II and IV, but no effect in that due to pneumococcus type III. Also, in a certain percentage of cases, this solution seemed to shorten the duration of the disease, and seemed to diminish the frequency of severe complications.

R. Heffron and G. W. Anderson (J. A. M. A., Oct. 21, 1933, p. 1286) report the results of the use of Felton's antibody solution in the treatment of 421 cases of pneumonia. Among these were 188 case of type I pneumonia that were treated with serum. These yielded

a fatality rate of 10.6 per cent as contrasted with a rate of 25.9 per cent of 85 untreated cases of the same type.

Russell L. Cecil and Norman Plummer (J. A. M. A., Nov. 22, 1930, p. 1547) studied a series of 3,662 cases of pneumonia in adults and 271 cases in children. Of this series, 1.161 cases were type I infections. They found type I pneumonia rare in infants under 3 years but particularly prevalent in young adults. The mortality rate in 412 patients receiving no serum was 28.2 per cent. A marked reduction in the mortality rate was brought about by treatment with Huntoon's antibody solution as compared with an equal number of control cases. They also employed Felton's concentrated serum which is prepared by the addition of 20 per cent anhydrous sodium sulphate to standard antipneumococcus serum, incubation and dialysis. They believe the concentrated serum ten times as potent as the unconcentrated. A series of 239 cases of type I pneumonia treated with concentrated serum showed a mortality rate of 20 per cent as compared with 234 untreated cases with a mortality of 31 per cent. They conclude that type I serum is no longer in the experimental stage and gives striking clinical results when administered early in the disease.

Jesse G. M. Bullowa (J. A. M. A., May 12, 1934, p. 1560) observed 133 cases of pneumococcic pneumonia due to type VIII pneumococcus in 122 adults and 11 children. Thirty-seven adult patients were treated with serum and none died. Among 85 patients not treated with serum, 9 died. The duration of the illness was shorter in the serum treated patients than

in those who did not have serum.

M. Finland and W. D. Sutliff (J. A. M. A., Feb. 25, 1933, p. 500) treated a series of cases due to type II pneumococcus by giving a large amount of antibody solution in a short space of time. Most of the cases were given a first dose of 5 cc., a second dose of 25 cc. and then three or four doses of 40 cc. or 50 cc. at intervals of two hours. Further doses were then given after a lapse of from eight to twelve or more hours if the climical response was not entirely satisfactory. On the average a total of 175 cc. containing approximately \$40,000 units of type II antibodies were given in six

doses within twenty-four hours after treatment was started. In the group of 46 patients treated in this way, the death rate was considerably lowered and a rapid amelioration of fever and symptoms was observed in comparison with contemporaneous nonserum treated and comparable cases.

# MEDICINAL TREATMENT

The physician who has charge of a patient with pneumonia must decide whether a drug is needed to combat a condition or symptom and which drug is the best for the object desired. The following drugs are suggested as having positive value in certain conditions, and brief descriptions are given of the pharmacologic action expected of them:

Morphine or Codeine.—If the pain is acute in the beginning stages of pneumonia, one of these sedatives should be given. Acute pain is depressant and should not be permitted.

A cough that is frequent and unproductive, as it may be in the first stage of pneumonia, will be quieted and the pain alleviated by codeine sulphate in doses of 0.01 Gm. (1/6 grain) given every two, three or four hours as is necessary.

Acetanilid and Antipyrine .- Acetanilid, 0.065 Gm. (1 grain) every three hours for four or five doses, or antipyrine, 0.5 Gm. (71/2 grains) every four hours for two or three doses, may be of advantage in low-ering the high temperature in the first stage of this disease. Acetylsalicylic acid is another drug that is frequently used to relieve the discomfort of the first stage of pneumonia. These drugs also will lower the blood pressure and quiet the heart. Such an action may be needed in the very acute first stage of pneumonia, provided the heart is normal. At this stage the lowering of the blood pressure produced by these drugs is often beneficial. Later in the disease, even if there is high temperature, such coal tar products are contraindicated. Cold sponging is probably never justified as an antipyretic measure in pneumonia, but tepid or warm water sponging may be beneficial when there is hyperpyrexia.

During the administration of the specific serum, drugs affecting the temperature should not be given,

as the temperature is the best guide to the value of the serum or the necessity for repeated dosage.

Ammonium Chloride.—If the expectoration is adhesive and colseive, scanty in amount and difficult to raise, ammonium chloride acts satisfactorily and is indicated. The does should be 0.25 Gm. every two hours, given in a sour mixture or in lemonade; if there is much pain or if there is inferfective, frequent cough, it may be combined with codeine sulphate. Ammonium carbonate, besides being irritant and nauseating, does not have any tangible cardiac action as a stimulant; therefore it should not be used.

Digitalis.—If the patient does not die from toxenia, from exhaustion resulting from a later general toxenia, or from a migration of the pneumococci to the meninges, his survival or death depends on the ability of his heart to withstand the disease. The patient should never be allowed to make any movement that will cause the heart to tire or make it become more rapid.

The workers in the Rockefeller Institute suggest the use of some form of digitalis as a routine in these cases. Its use should be commenced early so that the patient is partially digitalized when necessity arises. Large does of an active preparation are given. When the effects of the digitalis appear, the drug is discontinued as long as the patient's condition indicates that its use is not necessary. However, it is not often well to digitalize a pneumonia patient, and late in the disease it may not be wise to push digitalis.

E. E. Cornwall (New York M. J., Nov. 15, 1922, p. 563), discussing the conservative treatment of pneumonia, says that he "can not see how overstimulating (poisoning) the presumably healthy heart muscle early in the course of a pneumonia can make it better able to stand strain later in the disease." Stimulation of the heart should be attempted purely for symptomatic support, that is, only when it is needed, and Cornwall would rely on strychnine and caffeine and perhaps strophanthic.

Large doses of digitalis should be used with great care if there are any signs of cardiac disease or kidney or liver defects, and also in arteriosclerosis. Consequently, the general condition of the patient must be very care

fully studied in pneumonia before one decides to attempt digitalization, as dangerous poisoning may occur.

Wyckoff, Dubois and Woodruff (J. A. M. A., Oct. 25, 1930, p. 1243) misst that there is no evidence that routine digitalis therapy in lobar pneumonia results in lowered mortality. Digitalis may perhaps save life in an occasional patient in whom there is auricular fibrillation or auricular flutter. They believe that the routine giving of digitalis to patients with lobar pneumonia is dangerous.

Sirophanthin.—This drug, in recently made sterile ampules and injected directly into one of the veins in the elbow, provided digitalis has not been recently administered, is often efficient in tiding a patient over a condition of shock. It should rarely be repeated.

Strychnine.—This is a drug that has been much overused. Clinically, strychnine is often most beneficial and even seems to tide patients over critical periods. In a sluggish, inefficiently contracting heart, when digitalis is contraindicated, strychnine may be of benefit. Accordingly an adult should not be given more than ½0 grain (2 mg.) hypodermically, if deemed advisable, once in six hours, and such a dosage should not be long continued. As soon as there is improvement, the drug should be given by mouth instead of hypodermically.

Combhor.—Laboratory observations and some hospital reports have not shown that camphor is of value in heart failure. On the other hand, clinical experience at the bedside not infrequently shows that hypodermic or intramuscular injections of a sterile preparation of camphor and oil improve the pulse as to its regularity and volume, cause the surface of the body to be warmer, and often relieve cardiac dyspine aby thus equalizing the circulation. When there is collapse, camphor given hypodermically every three or four hours combined with other proper treatment aids in saving the patient.

Coffeine.—The administration of this drug as coffee or drug, except epinephrine, the action of which is very fleeting, so frequently raises the blood pressure in serious conditions as does caffeine. In emergencies

it may be administered hypodermically, or it may be given by mouth several times in twenty-four hours. Caffeine is a cerebral stimulant and not a sleep producer. Its action on the heart is almost always for the good, except in some few patients who show an idiosyncrasy to it, the heart becoming irritable from any form of caffeine.

Epinephrine.—This active substance should be used more frequently, being placed in the mouth in cases of weak circulation and given intramuscularly in heart

failure

Venesection.—In the first congestive stage of pneumonia, venesection may be life-saving in a plethoric patient. In some cases when the right side of the heart is distended with blood, venesection gives great relief.

Glyceryl Trinitrate.—When pneumonia occurs in a full-blooded, sturdy man, especially if he is of the age when his blood pressure is a little high, small doses of glyceryl trinitrate, from ½00 to ½00 grain (0.3 to 0.6 mg.), every four to six hours, tend to dilate the peripheral vessels and relieve the internal congestion. This drug also slows and quiets the circulation. By bringing more blood to the surface of the body, it also tends to promote loss of heat and a reduction of temperature. It will never weaken the heart as long as the blood pressure is high; it should not be used if the blood pressure is low.

Hypnotics—In very weak conditions the only safe hypnotic is morphine, but with delirium it may be well to use some hypnotic other than morphine. Sometimes powder of piceca and opium (Dover's powder) works satisfactorily, as it tends to quiet the patient, and at the same time does not dry up the secretions. Almost any one of them causes some subsequent cardiac depression. The best hypnotic is perhaps chloral, although there is a prejudice against its use. An effective dose of chloral is probably no more depressant to the heart than is an effective dose of any other hypnotic. Soluble barbital may act satisfactorily.

#### SPECIAL TREATMENT

Quinine.—The enthusiastic backing of the treatment of pneumonia with large doses of quinine by S. Solis-Cohen (Ann. Clin. Med., September 1923, p. 90) must be considered. He gives a quinine preparation intravenously or by mouth. He does not use the drug as an antipyretic, but as an "antitoxic," although the fall of temperature is an index of its satisfactory action. His method may be studied in his various publications.

Aufrecht successfully prescribes 2 Gm, of quinine hydrochloride, 1 Gm. of urethane (ethyl carbamide), and 20 Gm. of distilled water. The urethane permits the dissolving of the quinine hydrochloride in a small quantity of water. When this mixture is used 0.5 Gm. of quinine hydrochloride can be administered in 5 Gm, of fluid. The usual number of injections required is two or three, given at twelve or twenty-four hour intervals. The best sites for the injections, Aufrecht holds, are the lateral abdominal walls, the injection is made carefully and the needle removed slowly by pressing a cotton compress on the skin around the puncture, there is no bleeding and the injected fluid spreads easily in the loose tissue. When the distilled water is too cold, the quinine precipitates, but it can be dissolved again if the container is placed in a warm bath. Aufrecht employed quinine therapy only in lobar pneumonia and not in bronchopneumonia or pneumonia due to the Friedlander hacillus. All his patients were adults. In several hundred cases treated he did not note any complications. Aufrecht injected the quinine subcutaneously. Berger reports favorable results with injections intramuscularly into the extensor muscles of the thigh. Although quinine has been used in the treatment of pneumonia, its value has not yet been fully demonstrated: furthermore, all recent work seems to show that intramuscular injections are absorbed less efficiently than oral

Oxygen.—Cyanosis can be met only by increasing the gradient between the alveolar and the blood oxygen by inhalation of oxygen with a mask, nasal inhaler,

catheter or well ventilated tent.

The administration of oxygen from small tanks with a funnel is not approved. The funnel must be held close to the face, which procedure interferes with escape of carbon dioxide and of moisture, or at such a distance as prevents an adequate increase of the concentration of oxygen in the air breathed. A preferred method is with an inhalter (Connel, Sanford or

Bullowa) which delivers moistened oxygen just inside the nares, or with a catheter or catheters leading to the nasopharynx (Bullowa, J. G. M.: *Internat. Clin.*, December 1931, p. 262).

There is absolutely no difference between industrial and "medical" oxygen. Some salesmen attempt to make physicians believe there is.

The small tanks contain insufficient oxygen for continuous treatment. They contain either II cubic feet (100 gallons) or 17 cubic feet (130 gallons) of oxygen (7½ gallons = 1 cubic foot) and cost about half the price of large tanks containing 220 cubic feet (more than twenty times as much oxygen). The small tanks have the further disadvantage of usually having neither a gage to indicate the rate of flow nor one to show the cylinder pressure. The latter tell how much oxygen is in the cylinder pressure. The latter tell how much oxygen is in available wherever there is a welder (which is in nearly every earage in almost any community).

With large tanks (220 cubic feet) at 2,200 pounds pressure, as pressure regulator and a flow gage are encessary. The variable orifice meter or float gage, calibrated for liters per minute, is the preferred form. In the absence of such a clinical regulator, one may improvise with the welding equipment of the garage. The pressure regulators of welders are said to be accurate to 3 per cent, and they bear to register at 2 pounds a viewn orifice are well known as a given pressure through a viewn orifice are well known.

An orifice meter may be improvised, suitable for clinical use, by placing a metal disk with a suitable drill hole in series with the welding regulator, as shown in the accompanying diagram. The amount of gas passed in liters per minute is approximately half the number of cubic feet per hour for the given pressure. An Airco No. 1 welding tip may be used (No. 68 drill), or that of some other manufacturer, with the same size opening.

The table gives the amount of gas, in cubic feet per hour, passing common drill sizes at the pounds pressure indicated. The figures, divided by 2, give liters per minute.

	Flow in Cubic	Feet per Hour	
sure	Drill No. 60	Drill No. 65	Drill No. 70
1	9.0	7.0	4.4
2	12.8	9.8	6.2
3	15.7	12.0	7.6
4	18.0	13.8	8.7

2	12.8	9.8	6.2
3	15.7	12.0	7.6
4	18.0	13.8	8.7
5	20.3	15.4	9.8
6	22.1	16.8	10.7
. 7	23.8	18.2	11.6
8	25.6	19.4	12.3
9	27.0	20.6	13.1
10	28.4	21.6	13.8

Pres

The gas should be passed through a water bottle to prevent drying of the nasal mucous membrane. At 4 liters per minute, a large tank of oxygen provides enough oxygen for continuous inhalation for more than twenty-four hours, at a cost of little more than \$5 for oxygen.

Oxygen should be given continuously, if indicated. It is good practice not to wait until there is marked cyanosis before administering oxygen. The oxygen gradient should be increased before the mechanism that prevents cyanosis is exhausted. At Harlem Hospital, oxygen by nasal inhaler is given, in pneumonia, when the normal respiratory rate is doubled, or 36 per minute, or the pulse reaches 120, or if there is cyanosis of the nail beds (Bullowa: Internat. Clin., December 1931, p. 262).

The intermittent administration of oxygen with a fundamental was born of economizing with the gas in the days of small and expensive cylinders before liquefaction or electrolytic oxygen was made, and it has no place in the medicine of today. Relatively inexpensive oxygen, suitable for inhalation is in almost every repair garage, and the apparatus for increasing the concentration of the pharyngeal oxygen by at least 50 per cent can be improvised almost anywhere from the welder's equipment. The physician or hospital may have a clinical regulator available for an emergency.

Carbon Dioxide.—In view of the relationship between atelectasis and certain types of pneumonia

between atelectasis and certain types of pneumonia, Henderson and his associates suggest the use of inhalation of carbon dioxide early in the treatment of pneumonia since such inhalations are effective in relieving

atelectasis.

A. Behrend and R. B. G. Cowper (J. A. M. A., June 9, 1934, p. 1907) treated 11 patients with unilateral pneumonia with artificial pneumothorax to compress the affected lung; 2 died. Neither of these fatalities could be directly attributed to the pneumo-thorax. They declare that this collapse therapy is a rational form of treatment of lobar pneumonia, based on sound surgical principles. They further state that it relieves the pain of the pleurisy that frequently accompanies lobar pneumonia, and with it it is possible to induce a critical fall in temperature. They report no

complications were seen which were directly attributable to the procedure.

#### SENILE PNEUMONIA

Pneumonia in the old presents many different symptoms from pneumonia found in younger persons; in fact, it has been stated that pneumonia may be a natural termination of old age. M. W. Thewlis (M. J. & Re, D, Dec. 3, 1924, D, 166) notes that some of these senile patients may be ambulatory and still show pneumonic congestion, and that the asthenic type, without much fever, is often seen. The prognosis of this slow going type, however, is serious, and gentle circulatory stimulation should be given throughout the disease. In such cases of congestion of the lung, unless the patient is seriously ill, he should be encouraged to sit up and not remain in bed too long and certainly he should not lie long in one position. The circulatory weakness which is constant in old persons adds to the lung congestion.

#### CONCLUSION

There is no specific cure for most cases of pneumonia. The resources of the physician will be taxed and his judgment put to a severe test by many a case of this disease.

To repeat, a restful, quiet room, a sensible, efficient nurse, a sufficient amount of fresh air, and a suitable diet and proper care of the bowels will help to prevent high temperature, heart failure, low blood pressure, insommia, tympanites and toxemia in many cases. Prevention of these serious conditions is if possible most important.

Postoperative pneumonia is all too common, and could frequently be prevented by greater preoperative and postoperative care. The patient's mouth and throat should be cleaned of infection completely, if the operation is not one of emergency, and if it is one of emergency, antiseptic mouth washes should be used before the anesthetic is administered. The stomach must not contain any food before the anesthetic is given. If there is any doubt that food is in the stomach, gastric lavage should be done. It is important that the operating room be warm, that warm blankets be used about

the patient, and that there should be no possibility of chilling the patient's body when the final dressings are adjusted or by the removal of the coverings following the operation. The bed to which the patient is removed must be warm, and the air that he inhales must be warm until such time as the anesthetic has been completely eliminated, especially after ether anesthesia. The patient's head and shoulders should not be elevated after more or less prolonged etherization, lest heart weakness be added to the possibility of a lung congestion. Great care must also be taken that regurgitations of mucus and fluid from the stomach be wiped out of the mouth and not assirated.

# ABSCESS OF THE LUNG AND EMPYEMA

Abscess of the lung is not infrequent and is always serious. It occurs most frequently as a postoperative condition following tonsillectomy, but it may occur after almost any operation, and is a complication of influenza and of pneumonia. It is a sequence of tonsillectomy most generally because infected sub-stances or blood are aspirated into the lung during or immediately after the operation. In such cases the right lung is more often affected. W. F. Moore (J. A. M. A., April 29, 1922, p. 1279) concludes that lung abscess develops about once in from 2,500 to 3,000 cases following tonsillectomy. Although it may occur after this operation from an embolus or through the development of infection in some gland in the thoracic cavity through the lymphatic system, still, it seems generally to be caused by direct inhalation through the bronchial tubes. Consequently, this possible complication must always be considered whenever the tonsils are to be removed. The patient should be placed in a lateral position as soon as possible, and it is advisable to use a suction apparatus to prevent secretions from reaching the trachea. Some surgeons disapprove of ether anesthesia for this operation.

When a lung abscess develops after some other operation, especially after an abdominal operation, it is probably caused by emboli reaching the blood stream. The seriousness of fat embolism is well understood.

Abscesses developing during the course of influenza or pneumonia may be multiple. It is quite possible that the old method of poulticing the chest in pneumonia caused such congestion of the pleural blood vessels as to encourage infection of the pleural blood vessels as as to encourage infection of the pleura and empyema. The same is possibly true of the new treatment of pneumonia with diathermy. At least anything that can congest and dilate the pleural blood vessels must be considered a possible predisposing cause of pleural infection and of emovema.

The location of an abscess, while often determined by physical signs, can be properly studied only by the roentgen ray, and repeated pictures and fluoroscopic examinations will show whether or not the abscess is enlarging or diminishing in size. Conservative and postural treatment should be the first rule, but usually, if the condition is not cured in about three months. surgical help should be sought. If the abscess is deeply located in a lobe, it is dangerous to do any diagnostic or evacuation puncturing, as healthy lung tissue may become infected. If the abscess is near the surface of the lung, bordering on the pleural cavity, aspiration may be both advisable and curative. Even with the help of the roentgen ray, it is sometimes very difficult to locate the abscess exactly. Pockets of pus often occur in the pleural cavity, in the form of localized emovema.

Pilot and Davis (Arch. Int. Med., September 1924, p. 313) studied the bacteriology in pulmonary abscesses, and believe that the source of infection generally "relates back to the teeth and tonsils where the fusiform bacilli and spirochetes and cocci are present in enormous numbers. The prevention of these pulmonary infections, therefore, lies in the proper hygiene of the mouth." D. Graham (Canad. M. A. J.. December 1923, p. 863) studied the bacteriology of pleural effusions in influenzal pneumonia. He found Streptococcus hemolyticus alone or combined with the pneumococcus or with Bacillus influenzae in 56 per cent of 43 cases. In some cases, he found the pneumococcus alone or combined with the bacteria mentioned, or with Streptococcus viridans, or Staphylococcus aureus. He believes that B. influenzae, Staphylococcus aureus and Streptococcus viridans infections were always secondary to infection with Streptococcus hemolyticus or with the pneumococcus in these pleural effusions. The mortality in these 43 cases of influenzal pneumonia with pleural effusions was 46 per cent.

J. A. Miller and A. V. S. Lambert (Am. J. M. Sc., January 1926, p. 81) urge the combination of the internist, the surgeon, the skilled bronchoscopist and the roentgenologist in the management of abscess of the lung. Such care gives the patient the best possible chance of cure, and also determines when tentative treatment should cease and surgical treatment begin. They insist that from 40 to 50 per cent of all patients

will subsequently need surgical treatment.

Miller and Lambert believe that "artificial pneumothorax has a very limited field of usefulness in abscess of the lung," while C. A. Hedblom (J. A. M. A., Nov. 15, 1924, p. 1577) maintains that "pneumothorax collapse of the lung, when indicated, is a safe, conservative method of treatment, and has yielded gratifying results." It is indicated when an abscess is centrally located, the collapse of the lung promoting drainage, lessening absorption and preventing extension of the process. Pneumothorax is contraindicated, he adds, in peripheral abscesses because of pleural adhesions which prevent pulmonary collapse. Pneumo-thorax would increase the risk of perforation of such a peripheral abscess into the pleural cavity, causing a secondary empyema, which is a serious and often fatal complication. In multiple lung abscess, he believes that pneumothorax is ineffectual

Hedblom declares that "thoracotomy drainage is the operation of choice in all cases of solitary abscess not centrally located and which do not show unmistakable progress toward a spontaneous cure." Too long expectant treatment in these cases is dangerous. "To attempt pneumothorax collapse in case of an abscess implinging on the parietal pleura is an irrational and dangerous procedure." He found that abscesses of the lung following tonsillectomy are multilocular from the onset and that patients with such abscesses are poor surgical risks, though "lobectomy following a graded thoracoplasty has been performed without mortality."

John Alexander and William W. Buckingham (J. A. John Alexander and

John Alexander and William W. Buckingham (J. A. M. A., Nov. 15, 1930, p. 1478) suggest that if an abscess still persists after postural drainage and bronchoscopic

aspiration a temporary phrenic nerve interruption should be performed. They believe that pneumothorax, if used at all, should be limited to the early stages of abscess and preferably to abscesses in the upper part of the lung where adhesions seem to form later than in those in the lower part of the lung. They argue further that pneumothorax should not be used for the abscesses that dwell in the peripheral part of the lung. If with these measures, in from six to ten weeks after onset of the condition the patient is not showing signs of genuine improvement, surgical drainage of the abscess must not be delawed.

S. W. Harrington (J. A. M. A., Oct. 9, 1926, p. 1200), in discussing the surgical treatment of pulmonary suppuration, says that "chronic bronchiectation types present the greatest difficulties." There is a diversity of opinion as to the most effective surgical procedure, and the operative mortality is high, but surgical collapse of the lung often gives complete subjective relief. Extrapleural thoracoplasty is the term applied to rib resection to secure collapse of a diseased lung, and Hedblom (Ann. Clin. Med., May 1926, p. 921) says that "graded extrapleural thoracoplasty is indicated in diffuse unilateral bronchiectasis, chronic unilateral pulmonary tuberculosis, tuberculous empyema. with massive lung collapse and chronic non-tuberculous empyema, with extensive lung collapse if the lung cannot be re-expanded."

S. U. Marietta, (J. A. M. A., April 28, 1934, p. 1363) insists that more than 50 per cent of cases of acute pulmonary abscess may be brought to a satisfactory conclusion by medical treatment alone. The essential feature of medical treatment is postural drainage. By this is meant the mechanical emptying of the abscess area as far as possible by placing the patient in such positions as will bring this about. The treatment is so simple that it can be carried out in the patient's home, so long as adjunct measures are not required. Bronchoscopic drainage is a valuable adjunct to the medical treatment of acute lung abscess.

Empyema.—A. V. Moschcowitz (Am. J. M. Sc., May 1920, p. 669) argues that empyema generally results from the rupture of a subpleural pulmonary abscess. He believes that purulent pleurisy goes

through the stages of serous fluid, then seropurulent fluid, and finally pus with the development of more or less adhesions. He found that the vast majority of empyemas are encapsulated, and that very few occup the entire pleural space. He suggests that in the early stages, aspiration of the fluid be done every twelve or twenty-four hours if there is any respiratory embarrassment as a result of pressure of the fluid. He found that after operative treatment for an empyema the Carrel-Dakin method of treatment was quite valuable, and that recurrences of the empyema were less frequent when surgical solution of chlorinated soda was used.

A. O. Wilensky (Am. J. M. Sc., September 1920, p. 384) maintains that the greatest obstacle to the healing of an empyema is a bronchopulmonary fistula, although the fistula may be very small and difficult of demonstration. This is doubtless a cause of the frequent recurrences after apparent healing of the

empvema.

Whether or not fluid in a serous or seropurulent pleurisy should be aspirated or repeatedly aspirated must depend on the amount of discomfort that the fluid causes. If the dyspnea is serious or if there is pressure on the heart the fluid must be removed, whatever subsequent surgical treatment seems advisable. On the other hand, if the fluid is not present in large amounts, if fever is not caused by the absorption of purulent and semipurulent secretions, and if there is not a leukocyte count that shows serious systemic infection, the treatment may be conservative, but real pus should not be allowed to remain long in any cavity of the body. It is not wise to break up adhesions that have become protective in the pleural cavity against extension of the purulent infection. It should be noted that the constituents of the pleural fluid are more or less protective against the germs of infection, and therefore when removed may allow a greater latitude of growth of the pathogenic bacteria. Under any circumstances, it is generally unwise to remove all the fluid from the cavity at any given aspiration, unless it is pus in a pocket. The fluid keeps apart the irritated surfaces of the pleura, and when too much is removed. severe coughing and sometimes severe cardiac symptoms may occur.

It may be noted here that subdiaphragmatic absecss occasionally occurs and should always be considered as a possibility in the presence of unusual, unexplainable symptoms, especially in postoperative cases. The roentiegn ray is an important aid in making a diagnosis of this condition. The excursion of the diaphragm is always interfered with in the region in which such an absecss occurs.

Brooks and Cecil (Arch. Int. Med., September 1918. p. 269) reported the results of their study of 300 cases of pneumonia occurring at Camp Upton, in which 80 cases of empyema developed. Fifteen of these empremas were caused by the pneumococcus, 15 were apparently sterile, and the remainder were caused by a streptococcus, chiefly of the hemolytic type. Usually a bronchopneumonia preceded a streptococcus empyema, and a lobar pneumonia the pneumococcus empyema. They also found that some empyemas were due to Streptococcus viridans (Streptococcus nonhemolyticus). They noted that the pronosis was best when operative procedures were not undertaken until the pus had thickened. Many times the condition was difficult to diagnose, and these authors believe that frequent exploratory punctures of the pleural cavity may be made to determine the condition present. Of course, roentgen ray and fluoroscopic examinations will aid materially in ascertaining the exact condition of the pleura and lungs.

Young children, especially infants, suffering from pneumonia not infrequently develop empyema. The mortality in young children with this condition is high but decreases with the increasing are of the child.

R. C. Spence (Am. I. Dis. Child.) December 1920, p. 545) found the pueumococus in pure culture in the pus from the pleural cavity in 70 per cent of the 204 cases of empyema that he studied. He found that the degree of leukocytosis in these cases was no guide as to prognosis or diagnosis, and that siphon drainage gave better results in the treatment of empyema in infrancy than any other method of treatment.

James Wynn (Am. J. M. Sc., March 1921, p. 387) concluded that the best treatment of acute empyema was by "palliative aspiration until cicatricial exclusion of the general pleural cavity has made rib resection

the operation of safety and choice." In chronic empyema, the treatment for the obliteration of the permanent cavity was by "subperiosteal rib resection and at times parietal pleura extirpation."

### RHEUMATIC FEVER

In some parts of the country and in some hospitals acute rheumatic fever seems to have increased. The general opinion is that acute multiple arthritis has decreased, possibly because more tonsils are removed in early childhood. Acute or subacute tonsillitis seems to be the most frequent initial stage of the infection that causes acute rheumatism. Albert D. Kaiser, in a comparative study of 2,200 tonsillectomized children with an equal number of controls, three and ten years after operation (J. A. M. A., Sept. 20, 1930, p. 837) found that first attacks of rheumatic manifestations occur from 30 to 50 per cent less often in tonsillectomized children. The prevention of recurrent attacks is apparently not aided by tonsillectomy. Probably many cases of neuritis have been termed rheumatism; also many joint inflammations due to some other infective agent than the one that causes rheumatic fever have been classed as that disease. It is certainly common for one or more joints to be affected by any sentic process, and also by many nonseptic infections.

Pemberton after studying 400 cases of arthritis in the army, concluded that it is more likely to develop in those who have previously had the disease, and that exposure was an exciting factor in 50 per cent of these cases. He found foci of infection in 72 per cent of these 400 patients, the tonsils being the seat of infection in 52 per cent, the teeth in 33.5 per cent, and the genito-urinary tract in 12.5 per cent. The parts most frequently involved were the knees, the ankles, the hips and the shoulders in the order named. A severely affected joint quite frequently becomes greatly improved before another joint is attacked. Pemberton noted that the removal of causative foci of infection hastened recovery, and also noted that there is a lowered sugar tolerance in cases in which focal infection is present, this being true also in these cases of arthritis

The most severe complication, or perhaps phase of the disease is inflammation of the heart. The first noticeable sign that the heart is involved is a soft systolic murmur resulting from changes in the valves. Later, myocardial disability develops and some signs of pericarditis, all with more or less severe symptoms. The patient may die from this cardiac inflammation, with perhaps dilatation and decompensation. If he survives, the valves are the parts most affected, and if there was pericardial inflammation in any part, it has been cured by adhesions. The nodules in the heart described by Aschoff seem to be due to this rheumatic virus, and occur in the myocardium of the left ventricle. Also, beadlike excrescences may occur on the margins of the heart valves.

C. F. Coombs (Brit. M. J., Feb. 8, 1930, p. 227) is convinced that children acquire rheumatism because defects of inheritance and environment combine to permit an invasion of organisms through the tonsils in at least one third of the cases. It is possible also that the infection takes place through the tonsils in the remainder of the cases without exciting any perceptible protest at the site of entry. Coombs points out that the lesions of rheumatism affect the heart. the joints, the meninges, the subcutaneous tissues and even the lungs. The damage is much more diffuse than it was once thought to be. Coombs does not recall one child who passed through an attack of articular rheumatism without showing some evidence of cardiac involvement. He suggests that one think of carditis as the disease and arthritis and chorea as the complications

T. T. Mackie (Am. J. M. Sc., August 1926, p. 199) studied 393 cases of rheumatic fever and 89 cases of chorea, and found that rheumatic fever in about 70 per cent of all cases was a chronic disease characterized by recurrences of acute symptoms, as fever, arthritis, and leukocytosis. "Serious cardiac involvement occurs in 68 per cent of cases irrespective of age." Age is an important factor in the prognosis, as under the age of fifteen years there is the highest incidence in first attacks of cardiac involvement and in the liability to recurrence. About 78 per cent of all

patients at this age present evidence of this complication in the first attack, and only after the age of 25 years does the incidence of heart disease fall below 50 per cent in the first attack of rheumatic fever. He found tonsil infection to be more than twice as frequent in the cases of rheumatic fever as in the 400 nonrheumatic controls. The removal of infected tonsils, when present, and appropriate treatment for other foci of infection "reduces, but does not remove the incidence of recurrences of rheumatic fever." He finds that the younger the patient with his first attack of rheumatism, the greater is the probability of recurrence, and that 39 per cent of patients having the first attack between the fifth and tenth year have recurrences of acute conditions.

From these facts, the importance of any measures that will prevent the development of chorea and rheumatic fever is self evident. Infected tonsils, infected teeth and infected sinuses must not be tolerated in young children. Whatever other factors or foci of infection may cause rheumatic fever with the serious complication of heart disease, these frequent causes can certainly be eradicated and must constantly be borne in mind by the family physician.

In making the diagnosis of the cause of joint inflammation, S. A. Twinch (M. J. & Rec., April 15, 1925, p. 466) suggests the following points for consideration:

Is it acute or chronic rheumatism? Is it specific? Is it tuberculous? Is it an infection, due to some focus, the chief sources of which are the teeth, tonsils, head sinuses and cavities, gallbladder, appendix, colon? Is it of metabolic origin due to faults in the endocrine system alone? Is it complicated by infection from the colon or elsewhere in the hody?

#### TREATMENT

If a focus of infection is found it should be eliminated. In acute cases, even though the focus of infection is in the tonsils, it is not advisable to remove them at once, but rather to wait until the patient's general condition improves.

The importance of a tonsil as a focus of infection does not depend on its size. In other words, a small tonsil may carry more serious infection than a large one. Also, tonsils may be seriously infected although there may not be any history of tonsillitis or of quinsy. It should be noted that the late removal of infected tonsils, after there have long been symptoms of chronic infection and perhaps recurrent acute rheumatism, may not prevent future attacks of rheumatism. Even when infected tonsils have been carefully removed, it is not infrequent to find tonsil tissue left in the tonsil cavity that ultimately may show pockets of infection. It should again be emphasized that not only tonsils, but infected teeth and infected gums may be the source of focal infection in all forms of arthritis.

Children may have some endocrine disturbance that becomes an etiologic factor in joint infections. One must always be alert to the possibility of an arthritis being tuberculous. Many acute diseases cause joint pains, as well as do septic infections, such as scarlet

fever, meningitis, pneumonia and influenza.

Patients who are acutely ill should be treated as in other instances of acute infection. The bowels should be moved at least every other day and perhaps more frequently if the patient's condition permits; the mouth should be kept clean, and all the phases of personal

hygiene enforced.

It has long been believed that the salicylates have a special effect in rheumatism and it has been customary to give them in large doses. Hanzlik and his associates made a comparative study of cases treated with and without salicylates. Their results indicate that the salicylates do not possess any unusual action or peculiar specificity in rheumatic fever. In some patients in whom the symptoms persisted, although in a considerably moderated form, after treatment with nonsalicyl antipyretics and analgesics, salicylates appeared to give more permanent relief. Eliminating the elements of time, rest, and natural recovery, relief of late symptoms was brought about more effectively and permanently by salicylates than by combinations of drugs whose pharmacologic actions are similar, but different chemically, On the whole, the salicylates must be considered as symptomatic remedies which can be administered safely in large doses. These represent a fortunate combination of antipyretic and analgesic qualities making

them more suitable and desirable for the treatment of rheumatic fever than combinations of opiates and various antipyretics. The salicylates in large doses may

have an unfavorable action on the kidneys.

The saliculates may be given in doses of from 5 to 10 grains (0.32 to 0.65 Gm.) every two or three hours, the treatment being continued for perhaps a week after the patient is free from symptoms. At the same time potassium or sodium citrate is often valuable in keeping the system properly alkaline. Two grams (30 grains) three or four times in twenty-four hours for a time is generally sufficient for this purpose.

Acetylsalicylic acid is not beneficial in acute arthritis. although it is efficacious for muscle pains, myalgias and, at times, of value in neuritis. It is depressant to the heart and should not be used continuously as is necessary for the best action of a salicylate in acute rheumatism. Cinchophen and neocinchophen are rarely useful in acute joint troubles, although they are often of value in chronic disturbances.

Amidopyrine has also been advised to combat pain and lessen toxemia.

# PAIN

For the relief of pain, a small amount of morphine is better than a large amount of a coal tar product. This is always true when pain is constantly recurring. The repeated administration of any coal tar preparation is inadvisable in acute conditions.

The most important measure is immobilization and protection of the inflamed joints. Measures may be

employed which increase hyperemia,

The care of the individual joints which are inflamed cannot be dogmatically outlined. The joint and limb should be placed in the position that gives the patient the most comfort. If several joints of a limb are involved, and especially if there tend to be more or less troublesome muscle contractions, or an inadvertent movement causes excruciating pain, a splint may be devised to keep the limb at rest. Warm, moist applications, and perhaps nothing is better than alcohol fomentations (one part of alcohol to 3 or 4 parts of warm water; a towel or napkin soaked in this and then wrung out just sufficiently not to drip, wound around the joint and then covered with oil silk), will probably give as much comfort as any application. These should be changed as frequently as they become cool. Sometimes dry cotton around the joint brings as much comfort as any application. The official methyl salicylate or oil of wintergreen may be applied, but probably neither gives more relief than the alcohol dressing. Diathermy, cupping and various hyperemic treatments may be of value.

The convalescence following rheumatism should be prolonged until the patient is thoroughly able to attend to his work. If there is a cardiac complication, prolonged rest is positively necessary. It can never be determined how much endocardial inflammation was present, how much valvular inflammation and thickening will be permanent, or how perfect the repair of the heart may be. Even when auscultatory evidence of cardiac complication has not been discovered, there may have been some inflammation which calls for prolonged rest. The administration of small doses of an iodide, best sodium iodide, from 0.10 to 0.20 Gm. (from 11/2 to 3 grains) three times a day, is often advisable. Such treatment has frequently seemed to hasten or aid in the complete recovery from endocarditis. Not every endocarditis from rheumatism leaves valvular lesions

While there is some confusion with regard to the effect of climate as a predisposing factor in rheumatic fever and the concomitant rheumatic endocarditis, it would seem quite certain that dampness is a factor. Spot maps in England show it to be definitely more frequent in the damper areas. In the United States it appears to be less frequent in the southern states and, among the southern states, much less frequent in those states with a dry climate. Southern Texas, New Mexico and Arizona, or warm dry regions in California, should be advantageous.

Physicians there apparently see much less rheumatic fever than is seen in the northern part of the United States, and patients sent there from the North have shown less tendency to recurrence. The lower altitudes are much to be preferred if there is any cardiac dis-

ease.

Milk, which is so valuable as a food in rheumatism, may not be suitable for every case. Care must be taken that it is well diluted, perhaps with lime water, lest, instead of soft curds, tough clots are formed in the stomach. Although meat does not cause rheumatism, it is advisable not to allow it as a food for a short period during convalescence, but to withhold meat for any great length of time is a mistake. Foods rich in purines should not be taken during the illness or convalescence. Eggs, green vegetables, and cereals should constitute the main food; later, fish or meat once a day may be permitted.

H. F. Swift and W. G. Wilson (J. A. M. A., June 28, 1930, p. 2091) report a 50 per cent reduction in the number of relapses in rheumatic fever as a result of

intravenous vaccination with streptococci.

### COMPLICATIONS

Circulatory weakness during rheumatic fever may be combated with strychnine, camphor, sometimes with

caffeine, and exceptionally with strophanthin.

In the treatment of this disease, it is important that the heart be watched daily by stethoscopic examination for any signs of endocarditis. This complication is so insidious that it may not cause symptoms appreciable to the patient. However, there may be an increase in temperature, due to cardiac pain or distress. While it is not proposed to describe here the treatment of endocarditis, it is suggested that an ice bag over the heart may inhibit the inflammation, that the salicylates should be stopped if endocarditis occurs, and that prolonged rest is essential.

# CHRONIC ARTHRITIS

Billings long ago showed that chronic deforming arthritis is primarily an infectious disease and that a most frequent cause is the nonhemolytic streptococcus, often of a mildly virulent type. Many other bacteria' can, of course, cause these joint troubles.

Chronic arthritis develops not only as a result of long continued bacterial infection but also on a basis of metabolic disturbances or gastro-intestinal derangement. Bacteria may locally infect a joint and produce

substances that are irritant. Mechanical injury to the joints whether irritation, pressure, overwork, or insufficient circulation from some old injury or anything that disturbs the nutrition of a particular joint or set of joints may become causes of chronic arthritis. The following localities may be the source of toxins in such cases: the teeth, tonsils, nasopharynx, sinuses, bronchial tubes, bronchiectatic cavities, infections of the gallbladder, appendix, seminal vesicles or fallopian tubes.

The American Committee for the Control of Rheumatism believes that at the present time no single infectious agent or any completely defined dietary deficiency or metabolic disturbance has been conclusively shown to be the sole cause of these disorders. It believes that any of these factors or certain combinations of them under appropriate circumstances may basically underlie the onset of the disease.

Pemberton and Pierce (Am. J. M. Sc., January 1927, p. 31) studied 1,100 cases of chronic arthritis and found that in civil life, in the majority of cases, the onset is gradual, and that the knee is the joint most frequently affected. The finger joints are the next most often attacked. Foci of infection were found in about 70 per cent of the cases, mostly in the mouth, throat and nose. The next most common location of the focal infection was in the genito-urinary organs. They speak of the frequency of symptoms referable to the nervous system in these arthritic cases, but they do not emphasize the fact that the cause is also the focal infection. They urge that chronic arthritis should not be considered incurable, and conclude that the results of proper treatment are quite satisfactory.

Cecil and Archer (J. A. M. A., Sept. 4, 1926, p. 741) studied 612 cases of chronic arthritis and made some interesting observations. They found that chronic infectious arthritis may attack not only one joint, but many joints of the body. The patient is likely to be underweight and anemic. The joints attacked are swollen, the skin over them generally shows signs of congestion, and the joints are painful. Sooner or later the joint becomes enlarged, as a result of periarticular thickening, and after several years an ankylosis may

develop which is first fibrous, but later may be due to bone development. If the focus of infection is the tonsil, the germ found is generally Streptococcus hemolyticus. If the focus of infection is a tooth root abscess. it is usually Streptococcus viridans. These clinicians also studied arthritis deformans, which is considered by some as a severe grade of chronic infectious arthritis. although Barker termed it a "primary progressive polyarthritis." Generally, these patients are over 40 years old and give a history of an average of seven vears' duration of the disease. The majority of these patients are females. The authors classify some cases of arthritis as degenerative and believe that these are not due to infection. They also note the arthritis which occurs so frequently in women at the menopause. Cecil and Archer found Heberden's nodes "in practically every case of menopause arthritis." While endocrine disturbances and changes in the metabolism are probably frequent causes of arthritis occurring at this period of life, still, careful search should generally reveal one or more foci of infection.

Cecil and Archer discuss senile arthritis as a separate form. The joints all over the body may naturally take on the senile degenerations, that is, shrinkage of soft tissues from the absorption of fart, disturbances due to impaired circulation, the drying of secretions, and irritation due to deposits, perhaps of salts. They also speak of spinal arthritis which is so often overlooked in backache and is ordinarily due to infection. S. Epstein (44m. J. M. S.C., March 1922, p. 401) calls attention to arthritis of the lumbar spine resulting from infection. The vertebrae and the perivertebral tissues are

involved.

According to Chester S. Keefer and Walter K. Myers (J. A. M. A., March 17, 1934, p. 811), the incidence of degenerative arthritis increases with advancing age. It is more prevalent in certain occupations when there has been injury to the joint surfaces, and when-static deformities are present. The anatomic changes can be explained on a basis of injury to the cartilage and bone which follows the wear and tear of the joint structures, and are not due to any particular disease process.

Sacro-iliac pain is frequent, but it is often due to other causes than infection. Sometimes there is actual bone development in the intravertebral spaces in spinal

arthritis

Pemberton (J. A. M. A., Dec. 25, 1920, p. 1759) found that in chronic arthritis there was likely to be a lowered sugar tolerance as well as disturbed utilization of protein and fat. In other words, with infection as the cause of chronic arthritis there is disturbed metabolism, and he believes that successful treatment is associated with the diminution of the carbohydrate intake. Whenever the circulation is impaired in a joint. pain and other symptoms develop, especially when the joint is not used, as at night. After the day's activity, the arthritis is often diminished. There is no question

that chilling of a joint adds to its disturbance.

Emil G. Vrtiak and Edwin P. Jordan (J. A. M. A., March 22, 1930, p. 863) classify arthritis as (1) hypertrophic, characterized clinically by Heberden's nodes of the fingers or similar bony lipping in other joints, grating of the knees, and frequently stiffness or limitation of motion in the joints; (2) atrophic, characterized clinically by fusiform soft tissue swelling and sometimes by redness of the interphalangeal joints and frequently the metacarpophalangeal joints, atrophy of the muscles of the hand; (3) infectious arthritis which is not clinically characteristic. The latter starts suddenly and may be monoarticular or polyarticular. Swelling and redness may or may not be present. They have studied 102 patients with arthritis. No definite relationship between the menopause and chronic arthritis could be demonstrated in their patients. They point out that secondary anemia is frequent in infectious arthritis while an erythrocytosis is common in the hypertrophic form. Leukocytosis is the usual occurrence in infectious arthritis but leukocytosis and leukopenia occur with about equal frequency in the hypertrophic type.

O. Steinbrocker and E. F. Hartung (J. A. M. A., March 4, 1933, p. 654) found the filament-nonfilament count a useful routine diagnostic aid in chronic arthritis. The neutrophils are divided by this procedure according to their age into two classes. The first or nonfilament group consists of the young neutrophils in

which the nucleus is unsegmented, or if segmented, the nuclear parts are still joined by thick portions of nuclear material. The filament group consists of those neutrophils in which a fine filament of chromatin material connects two or more segments of the nucleus; i. e., the true polymorphonuclear cells. The normal nonfilament count is 16 per cent or below and averages from 8 to 9.8 per cent. Filament-nonfilament counts in 50 patients with rheumatoid arthritis were abnormally elevated in 100 per cent of the patients. The filamentnonfilament count was normal in 26 patients, or 52 per cent, of a group of osteo-arthritic patients, while in the rest of this group, the count was elevated. The average nonfilament count was much higher in patients with rheumatoid arthritis than in osteoarthritic patients with an abnormal count. A normal count indicates that chronic rheumatoid infection is not present. An elevated count may indicate the presence of rheumatoid arthritis, mixed rheumatoid and osteoarthritis, or osteo-arthritis with active focal infection.

### GENERAL TREATMENT

Primary rest is necessary as long as motion causes pain. The etiologic factor must be sought and removed, if possible. The metabolism of the patient should be studied thoroughly, and the analysis should include repeated examinations of the exerctions. Worry, nervous fretting and mental irritation should be avoided.

In the treatment of individual joints, the measures suggested for the treatment of rheumatism should be borne in mind. Hyperenia about the joints may be produced and body baking may be of value in more generalized conditions. In varying time, from four to six weeks, passive motion with gentle massage may be begun. The local condition may be treated by heat applied through electric light, diathermy, baking or proper bandaging.

The amount of passive exercise must be gaged by the effect on the individual. The patient, always more or less nervous, tires easily. To these patients fatigue is painful. Rest, restorative food, pure air, environment of optimism, graduated passive and later active exercise will overcome the debility, malnutrition and poor general circulation. Daily systematic passive and active exercises increased gradually must be continued until a relative restoration occurs. This must be systematically and regularly performed. Usually a nurse or masseuse should teach the patient the lighter forms of calisthenics. A relapse is apt to occur when there is neglect of one or more of the important factors relating to nutrition, and general and local blood supply.

Ralph Pemberton (J. A. M. A., May 23, 1931, p. 1777) maintains that massage has three indications in the arthritic syndrome: first, to improve or maintain adequate conditions of circulation and drainage in the neighborhood of involved joints; second, to improve or correct the faulty physiologic processes in the soft structures and especially the muscles; and third, to compensate somewhat for the muscular inactivity that inevitably follows protracted local or systemic disability. The massage should be given in the neighborhood of and not over the affected joints. The application of heat to the involved part before massage iss usually beneficial. The massage must not be accompanied by movement of the joint. Great force is not necessary, especially at the beginning of the treatment.

#### VACCINES

Autogenous vaccines made from the dominating strains of streptococci obtained from the tissues and exudates of the focus of infection have been used but without any marked advantage, though they are generally harmless. However, employment of the general measures of management and treatment is absolutely necessary if one is to succeed in helping these patients. The use of vaccines in the treatment of chronic deforming arthritis without attempting to find or remove the dominating etiologic focus of infection and without a systematic hygienic management is irrational and most unjust to the patient.

Nonspecific protein injections have been tried in chronic arthritis with some reported success. Injections of milk as a nonspecific protein have been advocated in chronic arthritis, and some success has been noted.

Joseph L. Miller (J. A. M. A., Aug. 16, 1930, p. 465) remarks that it is safe to say that the use of non-

specific protein therapy is the only method of treatment that will immediately terminate polyarthritis. At least 50 per cent of the patients can be promptly relieved of their discomfort. About one half of them are cured; the others, after a few days, or occasionally after a week or more, have a recurrence. In giving typhoid vaccine as a nonspecific protein the following procedure may be employed:

 The initial dose of the intravenous injection varies between 10 million and 50 million, depending on the source of vaccine. Many hospitals make up their own, and therefore the potency varies. The dosage may be increased by 25 million at each successive injection, depending on the patient's response or reaction.

The interval depends on the reaction. Some authorities give the injection every two days until the patient gets a chill and develops fever. Others use the plan of an interval of from four to seven days.

3. The duration of treatment varies with the individual. Some physicians establish the rule of giving a dose every two days until chill and fever appear and then they stop. Others give the injection every four to seven days until the patient has had six good reactions. According to Russell L Ceal (J. A. M. A., April 22, 1933, p. 1220) the majority of cases of chronic arthritis fall into one or the other of two great groups. Rheumatoid arthritis is a clearly defined clinical entity which in most cases can be clearly differentiated from osteo-arthritis and from the so-called specific forms of infectious arthritis. Rheumatoid arthritis has its own pathology and usually runs a characteristic clinical course. Hypertrophic arthritis on the other hand appears to be a degenerative sensescent process.

Evidence is rapidly accumulating that rheumatoid arthritis (like rheumatic fever) is a chronic infection. This evidence comes from pathologic, bacteriologic, serologic and clinical sources. Allergy probably exerts an influence on the disease, but no more than in other

chronic infections.

By employing new bacteriologic methods, a number of investigators have succeeded in cultivating streptococci from the blood and joints of patients with rheumatoid arthritis. While these observations have not been confirmed in some laboratories, the presence of specific streptococcic agglutinins in the serum of rheumatoid patients would seem to refute the theory that these micro-organisms are contaminations. Furthermore, the case with which an experimental arthritis can be produced in rabbits by intravenous injection of these streptococci lends strong support to the proposition that rheumatoid arthritis is a streptococcic infection.

The rational treatment of rheumatoid arthritis embraces removal of foci of infection, emphasis on rest and a general building up program, consisting of carefully regulated diet, vitamins, iron and arsenic and adequate elimination through the intestines, bladder and skin. Streptococcus vaccine administered intravenously is of considerable value in many cases, though its modas operandi is not yet understood. Physical therapy if carefully supervised is useful in stimulating the local and general circulation. In advanced cases orthopedic surgery may solve an otherwise baffling problem.

On the other hand, Benjamin H. Archer (J. A. M. A. May 5, 1934, p. 1449) says "There appears to be a basis for the concept that rheumatoid arthritis and osteoarthritis are due to the same etiologic agents or group of agents and that the proliferative and degenerative pathologic changes by which the two types manifest themselves are the result of other factors than those of causation. There seems to be no conclusive evidence of the presence of streptococci in the blood and joints of patients with chronic arthritis. None of the vaccines employed at the present time in the treatment of chronic arthritis have been accepted by the Council on Pharmacy and Chemistry. There is no evidence at hand that they exercise any specific effect on the course of the disease. Dietary regulation and vitamin therapy apparently exercise no specific effect on the joint manifestations of patients with this disease.

In those cases associated with foci of infection, it seems wise to search for and remove this factor early in the course of the disease. In advanced cases, the measures found to be of greatest benefit to the patient are orthopedic procedures, physical therapy, the administration of drugs to allay pain and a change of climate.

Present knowledge of the subject, does not seem to warrant the view that certain definite measures should be applied only to certain definite types of arthritis. There is no conclusive evidence that the same measures do not apply at some time to all forms of non-specific arthritis.

# MEDICINAL TREATMENT

Medicinal treatment, except such treatment as is aimed to relieve pain, and to promote digestion, proper bowel activity, proper circulation, and proper character of the blood, is of little value. If there is thought to be hyperacidity of the secretions or at least decreased alkalinity, alkalis may be of value, but certainly alkalis should not be pushed to the point of interfering with gastric digestion. Salicylates are of but little value in chronic joint disturbances. Iodides in large doses may be of benefit to a fat patient. Small doses of an iodide stimulate the thyroid to extra activity, promote general metabolism, and may be of value in the individual case. The use of radon has been suggested and reports are available indicating that it may relieve pain and to some extent arrest the disease but the results are not permanent. Cinchophen and neocinchophen seem to yield relief frequently, especially to those of gouty tendency. Colchicum in chronic arthritis is probably of little value except as it may increase intestinal activity. The various laxative and alkaline waters have no specific action. If they are combined with increased muscular activity, increased activity of the skin, increased drinking of water in selected cases, a regulated diet and a regulated life, in other words, proper regimen, they may be of benefit. It is the regimen, however, and not the particular kind of salt that works the cure.

The important factors in the treatment of chronic arthritis are the removal of all foci of infection; the building up of the patient's nutrition; the prevention of indigestion and of putrefaction in the colon; the improvement of elimination; such measures as will cause healthy action of the skin; such local applications of heat to the joints, diathermy, and massage of joints and muscles, as seem indicated, and finally vaccine therapy, if other measures have failed. There should

also be skin tests to determine whether there is any anaphylactic reaction, especially to foods. As suggested, infection of the colon may be an important element in these cases, and colon washings and other treatment may be advisable. Hydrochloric acid is often of advantage in these cases, and cod liver oil and sun treatments are available. Intestinal fermentation may be prevented by acidophilus milk. Examination of the feces will disclose the character of the digestion and whether there is acid or alkaline fermentation. As noted, the starches and sugars should generally be reduced, as the sugar tolerance is below normal. The calcium of the blood has been found increased in arthritis deformans, and the calcium content may be abnormal in other forms of chronic arthritis.

Whether or not fooi of infection are present in other parts of the body, they may be present in the cervix and uterus, in the prostate and bladder, or there may be inflammation of the seminal vesicles, and of course the gallbladder is a frequent location of focal infection. Sphilis must also be excluded as a cause of inflammation of the joints. Thyroid disturbance and Raynaud's otheromena may be associated with joint abnormalities.

# PARAFFIN BATH AND DIATHERMY METHODS

An innovation in applying heat in arthritis is the use of the paraffin dip. The equipment for treatment by means of hot paraffin dips includes a metal or enamelware container which may be of various shapes and sizes, cakes of paraffin, and a heater.

The container may be the ordinary double boiler that is used in cooking cereals. It may be the shape of an electrical sterilizer. It may be the shape of a large coffee pot. It may be like a small clothes boiler

used in the laundry.

For the hand and arm, a container shaped like a medium-size electrical sterilizer is filled two-thirds full with paraffin, which can be melted by gas or electric heat. The paraffin comes like cakes of chocolate. The Standard Oil Company puts out a satisfactory product. These cakes are put into the container and heated to the melting point. One may use a thermometer in order to keep the temperature between 118 and 136 F.

A simpler method is to keep the heat at the point where it will melt the bulk of the paraffin, but a fresh half cake will remain in solid form at the bottom of the container.

The patient stands or sits and plunges his hand and lower forearm into the hot paraffin and removes it after from ten to thirty seconds. A coating of paraffin adheres to the part. At the end of from thirty to sixty seconds, when the coat is dry, the hand and forearm are again plunged in and another coat is added to the first. This process is repeated at intervals of from thirty to sixty seconds until six or eight coats have been applied.

The hand is then removed, placed on a pillow and remains for a period of from eight to ten minutes. The entire period, from the time the hand is first placed in the paraffin until the entire paraffin glove or gauntlet is removed should occupy from fifteen to twenty min-

utes

The "newest treatment" for chronic arthritis is fever therapy by means of diathermy, radiothermy or, more recently, the safer and simpler hot, air-conditioned cabinets. Fever sessions are given once or twice weekly. The patient's temperature is raised fairly rapidly to from 104 to 105 F. Certain special precautions are necessary to avoid untoward reactions, but when these are taken the procedure seems relatively safe.

The results to date are variable. Some assert that about 35 per cent of patients subjected to a series of from three to six fever sessions note marked amelioration in, and at times complete cessation of, the activity of the disease. This method of treatment is too new for final evaluation.

# ARTHRITIS DEFORMANS

The relation of infection elsewhere in the body to arthritis deformans has been emphasized, especially by Billings, and cannot easily be overestimated. The changes in the joints are not due to the absorption of toxins from the focus alone, but to actual localization in the joints of the bacteria themselves. The difficulty in obtaining the causative organism is great, owing to

the chronicity. By special methods Rosenow succeeded in isolating peculiar streptococci from the excised lymph glands draining the involved joints; from contracted and diseased muscles, and from excised portions of the diseased capsule of the joint itself. He recommended the use of a vaccine prepared from organisms thus isolated rather than from the streptococci in the focus. The use of even these vaccines, however, is quite futile unless the focus is removed. There may be a slight fever, more or less persistent or intermittent, in these cases, and the blood count will sometimes show a slow-going chronic infection; in other words, a mild amount of leukocytosis and often a lowered hemoglobin percentage.

The peculiar character of the changes, in which there is a proliferation of endothelial cells in the blood vessels about the involved joints with a consequent anemic necrosis, makes it clear that no matter what vaccine or other remedial agent is used, cure in advanced cases will be exceedingly difficult. Removal of the focus, the judicious use of autogenous vaccines in small doses prepared not from the focus but from the adjacent lymph gland or tissue itself, together with rest, good air, passive motion and forced feeding comprise rational procedures and yield substantial results.

When the condition of the joints is more or less acute, rest should be given temporarily, but as soon as the local inflammation has diminished, even if the joint is painful, the patient must be taught to use the joint, especially when the hands are affected. Such activity prevents the formation of adhesions and the

development of ankylosis.

It is important to consider the special needs of each joint; a joint may have become ankylosed in an unusable position, or its motion may be interfered with by marginal exostoses. Appropriate surgical treatment is needed in such cases. Other joints are benefited by immobilization with splints or adhesive tape. Continued infection, pain, and interference with locomotion may have resulted in partial invalidism, with attendant anemia, poor appetite and sluggishness of function of various organs of the body. With the removal of infection and with all possible mechanical correction of deformities should go attention to nutrition by giving a well balanced diet. Tonics containing iron aid in restoring the patient back to good health. Outdoor life and such moderate exercise as is consistent with the policy of rest for affected joints will help build up the general tone of the patient. After all foci of infection have been removed, the local joint conditions may be benefited by special occupations, particularly when the hands and arms are affected, though occupations of the hands, such as sewing or fancy work, may be impossible. The advice of an occupational specialist is of value in these cases.

Arthritic changes result from many causes, more frequently induced by general biologic factors, such as chemical, anaphylactic or toxic processes, than by infections of the joints themselves. It is probably true that infections, usually remote from the rheumatic joints, incite the chemical or toxic processes which cause the change in the joints. It is also probably true that other than infectious agents, i. e., trophic or toxic factors, may produce similar clinical disturbances.

The following are factors in the treatment that may be of benefit: (1) gradual traction in the line of deformity, (2) wedged casts, (3) a turnbuckle jacket, (4) ether anesthesia, (5) vaccine for pains, (6) posture training and (7) physical therapy, consisting of radiant heat gentle massage, very gentle manipulation and the sinusoidal current to improve muscle ton.

Diathermy is not always helpful in these cases, and in some it is actually harmful. There is not much hope of arresting the advance of the process in the joint, although this statement must be made with reservations. Factors that should be considered in the treatment are the clearing up of foci of infection; the application of moist, dry and radiant heat; fresh air and sunshine—which may necessitate change of climate; the use of ultraviolet radiation; small doses of acetyl-salicylic acid and amidopyrine and vaccines.

It is evident that a successful treatment of "a rheumatoid condition" may not always result. Cinchophen or neocinchophen, 0.5 Cm. (7½ grains), three times daily after meals, much water by mouth, quartz light, a low protein and a low purine diet should be tried. Finally, there is some evidence that sympathectomy will benefit true arthritis deformans, if such it be, but such treatment is hardly considered out of the experimental stage as yet.

ERYSIPELAS

#### FTIOLOGY

In the majority of cases of the facial type the point of entrance of the infection is through the nasal mucosa following a coryza. In others there may be abrasions of the scalp or face, and in many instances, the infection may begin in an operative wound. Ulcers and wounds are the usual origin of infection in the extremities.

#### ONSET AND COURSE

The attack usually begins with chills, headache and a rise of temperature, which symptoms precede the appearance of the local lesion by from twelve to twenty-four hours. In many cases, however, the burning and redness of the skin are the first symptoms noted.

Typical facial erysipelas, which starts at the bridge of the nose and spreads in butterfly pattern rather symmetrically over the cheeks, may remain thus limited, but in many cases it proceeds to involve the ears, the forehead, the scalp and the neck, except in the small percentage of cases which are of the migratory type. In the migratory variety it often affects the extremities symmetrically.

# DIAGNOSIS

The diagnosis is made from the characteristic skin appearance, the fever, bleb formation and desquamation.

# TREATMENT

The treatment consists of a purgative; a low caloric diet, mostly cereal; antipyretic measures, if required, a bromide sedative, if needed, and later circulatory stimulation, if the heart fails. Meningeal complications must be watched for, and treated if they develop.

On the affected part, continuous cold compresses of boric acid solution may be of value. In migratory cases the areas may be painted with picric acid solution. Collodion painted just outside the border of inflammation, from about one-half to one inch in width, may stop the spread of the disease, and nonflexible collodion

is the best to use. Mercurochrome-220 soluble in 5 per cent solutions has proved of benefit, painted over the inflamed area. Magnesium sulphate solutions or compresses are often efficient as a sedative. Many times a starch powder dressing is all that is needed.

If patients are inclined to pick the nose, local application of petrolatum, cold cream or boric acid ointment

may be used.

Various nonspecific protein injections and also stock streptococcus vaccines have been used with some success. Convalescent serum has been injected and found

to be of benefit.

K. E. Birkhaug (J. A. M. A., May 8, 1926, p. 1411) finds further evidence that "the etiologic agent in ervsipelas is a specific type of Streptococcus hemolyticus and that the serum produced with this specific type of micro-organism possesses very marked curative properties when administered early in the disease." 60 moderately severe cases of this disease, intramuscular injection of ervsipelas antistreptococcic serum in 100 cc. doses of unconcentrated serum or 15 to 20 cc. doses of concentrated serum, when administered during the first three days of the disease, caused a prompt beneficial action, with fall of temperature and pulse rate, fading of the eruption, and diminution of the local edema. When given later in the course of the disease. the toxic depression is ameliorated by these injections. After from twelve to eighteen hours there is always a drop in temperature after each injection. If the symptoms return, a second injection is given. Some serum sickness has been observed, but Birkhaug thinks that this will rarely occur when refined globulin serum is used.

Amoss has found an erysipelas streptococcus antitoxin to be of great value clinically in the treatment of erysipelas. He recommends 100 cc. doses of this serum, given intravenously, to be repeated in from twelve to twenty-four hours, if necessary. In severe cases of erysipelas, an intramuscular injection of 80 cc. is given at the same time as the intravenous injection. In early cases of the disease, one dose is usually sufficient; in more advanced cases, and in those in which there is severe toxemia, one or two additional doses may be necessary.

Symmers and Lewis (J. A. M. A., Sept. 10, 1927, p. 880) discuss the treatment with antitoxin of 131 patients with ervsipelas. Horses were immunized with erysipelas toxin and the serum produced. The earlier the patient receives the treatment, the more promptly is the disease arrested. The dosage is determined by each case. As a routine, they injected 25 cc. of the unrefined antitoxin as soon as the patient with ervsipelas entered the hospital, and repeated the amount, usually at intervals of twenty-four hours, until the erysipelas blush disappeared, the edema was dissipated, and the temperature was normal. They say that sometimes the disease was controlled by one injection, oftener by two injections, but most frequently by three injections. Occasionally, they gave from 100 to 150 cc. or more of the antiserum to a single patient. They did not observe any ill effects from the dosage used, except that in 9 cases some serum sickness developed, coming on in from two to seven days after the treatment and lasting from two days to a week. They maintain that "the antitoxin treatment of erysipelas marks an advance, the results of which are commensurate with those obtained in the treatment of diphtheria. As far as the immediate attack is concerned, ervsipelas is now a vanquished disease. Beyond the immediate attack, however, the antitoxin treatment does not promise anything it does not, for example, confer immunity, and recurrent attacks occur with the same freedom as in erysipelas treated by other methods; nor does it appear to diminish the incidence of complications, such as the abscesses which so frequently follow in the wake of this disease." They found that facial erysipelas responded more readily to the antitoxin treatment than did ervsipelas of other parts of the body. The injections were given intramuscularly, as they found the intravenous method dangerous.

Walter H. Ude and E. S. Platou (J. A. M. A., July 5, 1930, p. 1) made a comprehensive analysis of all the available data in 402 cases of erysipelas. These were classified according to the method of treatment and the data so arranged that a fairly accurate comparison of the results could be made. The methods of treatment used in these cases were magnesium sulphate and gly-cerin packs, roentgen irradiation, ultraviolet irradiation.

erysipelas antitoxin, roentgen irradiation and antitoxin, and ultraviolet irradiation and antitoxin. These methods of treatment have reduced the mortality from erysipelas 44 per cent. In cases treated by roentgen or ultraviolet irradiation the immediate results are exceedingly gratifying. The return to normal temperature and absence of symptoms takes place from three to four days earlier than in cases treated with magnesium sulphate and glycerin packs. Ultraviolet irradiation produced a clinical arrest of the disease with the first treatment in 92 per cent of the cases. The results obtained by irradiation and the use of antitoxin were about the same.

### ULTRAVIOLET RAYS IN ERYSIPELAS

L. M. Nightingale and Saul Starr (J. A. M. A., March 10, 1934, p. 761) state: Ultraviolet therapy alone gives better results in both infants and older children with erysipelas than does serum therapy.

As with serum, the earlier ultraviolet therapy is

given, the better will be the results.

In older children death was almost nil in previously healthy children over 2 years of age, and when it occurred it was due to complicating features such as Mongolism, pneumonia and the like.

In infants one out of five die despite early treatment for an uncomplicated erysipelas; if not treated early,

one out of three die.

Ultraviolet therapy to date has been most successful, least dangerous and least expensive. On this basis ultraviolet irradiation should be put above serum therapy in the treatment of ervsipelas.

### ROENTGEN RAY TREATMENT OF ERYSIPELAS

The roentgen treatment of crysipelas is a well established method. Among others, Magelhaes and Schmidt both reported excellent results in 1917. Hesse reported further successes in 1918, Schrader in 1921, and more recently Harbinson and Lawson in 1927 (California & West. Med., April 1927, p. 485), Platou, Schlutz and Collins (Am. I. Dis, Child., December 1927, p. 1930) and Notger von Oettingen (München. med. Wchnschr., Oct. 7, 1932, p. 1640). All these reports agree in stating that within twelve to twenty-four hours a large percentage of the patients become afebrile; in a smaller group the fever gradually diminishes and is gone after several days. In all the patients the pain, swelling and discomfort disappear in a few days. In some of them there is a recurrence of the fever, but most of these cases yield to a second irradiation. The percentage of failures is small.

Although erysipelas is a disease notably eccentric in its course, which makes the evaluation of therapeutic measures difficult, the good results of roentgen therapy are too prompt and occur in too large a percentage of the cases to be explainable as coincidence or spontaneous improyement.

The report of Platou, Schlutz and Collins is of particular interest because they give a comparison of the results of roentgen treatment with the older methods and with the antitoxin treatment. Temperature was reduced most promptly by roentgen rays, returning to normal in an average of 1.5 days, as against 2.2 days for the antitoxin treatment and from three to four days for the older methods. Symptoms subsided on an average in two days after roentgen treatment; 3.8 days after antitoxin and on an average in eight days after the older methods of treatment. The mortality in infants was 80 per cent under old methods and 50 per cent under roentgen treatment. The general mortality in their series was 23 per cent for cases treated by other measures and 6 per cent each for roentgen rays and antitoxin. The diseased area extended after the beginning of treatment in 24 per cent of the cases treated by roentgen rays, in 40 per cent of those treated by antitoxin, and in 68 per cent of those given other treatment. In 10 particularly severe cases they combined roentgen treatment with the use of antitoxin with good results and they believe that this is the best method of treatment for erysipelas.

In the older series the dosage of roentgen rays was high, a full erythema dose in all and more in some series; but in the latest report cited, that of von Oettingen, excellent results are reported for moderate doses, not over a fourth of the erythema dose repeated not more than once. This author points out that there is no value in waiting a week before giving the second

dose, as some stipulate, but that the second exposure should be given on the second day after the first one if results have not been satisfactory. Most authors state that they used about 100 kilovolts unfiltered, and Harbinson and Lawson point out the necessity of including a 3 cm. margin of apparently uninvolved skin in order to include all infected areas.

#### ROTHLISM

There are two types of botulinus toxins, A and B, and they do not seem to occur in the same individual. Doubtless type A is more poisonous than type B, and it is especially fatal to chickens. Until the type is determined, the polyvalent antitoxin should be administered. Immediately, when possible, a sample of the suspected food should be sent to a laboratory for animal tests.

The botulinus poison may be absorbed from any mucous membrane or abraded skin surface, and although symptoms of poisoning in some cases may not occur for two or three days, still the condition may prove fatal.

Almost any canned food packed at a cannery or preserved at home may become contaminated with this germ. Most frequently canned vegetables and canned fruits have been infected, but ripe olives, meats, canned spinach, canned pork and beans, and cottage cheese (as a result of milk contamination) have caused this poisoning: outbreaks have also been reported from sardines (canned with tomato sauce), potted meat and canned peas. It has also been caused by home-canned string beans and beets. A can containing this infection grows worse after a long period, and home-canned foods had best be cooked before serving. Suspected foods should be destroyed, even if it has been shown that boiling for thirty minutes destroys the germ. It should be emphasized that food contaminated with the botulinus toxins should be destroyed immediately.

## PROPHYLAXIS

Fortunately, food spoiled by Bacillus botulinus seems in most instances to have a cheesy odor, a bad taste and to be distinctly soft, but the infected can may be without odor or smell, and one small taste has proved fatal

String beans and nonacid vegetables may be rendered safe by sterilization for a sufficient time at the correct temperature in a pressure cooker, by drying, or by the addition of a 10 per cent brine solution to the cold pack method

#### SYMPTOMS

The first intimation of trouble is usually an indefinite indisposition, followed rapidly by muscular weakness which gradually increases to great prostration. There is constriction of the throat, difficulty in expectorating, thick speech, dryness of the mouth and dysphagia, apparently due to paralysis of the pharyngeal muscles. Swallowing becomes increasingly difficult, and finally complete aphonia may develop. The eye symptoms are among the earliest manifestations. Dimness of vision, and a blurring and mistiness are noted. Diplopia is another early symptom. Posis of the eye-lids develops and nystagmus may occur. Vomiting is a serious symptom in some cases, apparently associated with taking in of large doses of the toxin which produce gastric irritation. A feeling of pressure and weight at the pit of the stomach have been noted, and also chilliness and profuse perspiration. The patients become drowsy and comatose immediately before death. As the respiration weakens, evanosis appears.

Cowdry and Nicholson (J. Exper. Med., June 1924, p. 827) believe that this poison acts on the central nervous system and also on the nerve terminals. Edmunds and Long (J. A. M. A., Aug. 18, 1923, p. 542) insist that the poison acts especially on the endings of the motor nerves that are affected (a curare-like action); hence, the symptoms of paralysis.

#### TREATMENT

The immediate treatment, when the diagnosis of probable botulinus poisoning has been made, is to wash out the stomach; a good dose of magnesium subhate should be administered, and it is advisable to give one drop of croton oil, in sugar, on the tongue, to cause immediate evacuation of the bowels. This dose had perhaps best be given one-half hour after the magnesium sulphate has been administered. However, even when treatment is given immediately success can-

not be promised. While antitoxin is being awaited, the patient should be kept warm, and hypodermic stimulants, such as strychnine sulphate, atropine sulphate, camphor and caffeine, either as coffee by mouth or the drug hypodermically, should be given. It has been suggested that morphine be administered by mouth to stop the absorption from the stomach until the antitoxin can be given, but the evacuant method seems to be better. Artificial respiration should be done, if necessary. Strychnine should not be given if there is any constriction of the throat or chest.

Dickson and Burke have shown that there are two definite strains of the botulinus organism and that autitoxin against one type has no effect when infection is by the other type. Cases have been reported which seem to indicate that the proper serum, given early,

may have a life saving effect.

As it is not profitable for commercial houses to develop this little used antitoxin, only certain laboratories have developed the serum and have it on hand for emergencies. Consequently, it would seem the duty of the state boards of health to inform every city and town health officer of the nearest laboratory where the antitoxin can be obtained. Each physician should depend on his health officer to obtain a supply of the serum, when it is needed. An antitoxin that contains 200 units per cubic centimeter is considered satisfactory, and as many as 20,000 units have been injected intravenously. In mild cases there may be recovery without treatment. Serious cases may not be benefited with antitoxin, as it is generally obtained too late.

#### TETANUS

The incubation period of acute tetanus is from one to ten days, and of subacute tetanus from ten to twenty days. Fifty per cent of all cases develop between the fifth and seventh day, the majority apparently on the seventh day after infection. Acute tetanus lasts from one to ten days, and subacute tetanus from ten to twenty days. Not until the patient has fived until the tenth day of the disease is there an equal chance for life. After the tenth day, the patient's chances of recovery increase day by day.

There is probably always more or less leukocytosis in tetanus, and Hill found the average count to be 13,000. The eosinophils seem to be diminished in number.

The tetanus bacillus is a cylindric rod, larger at one end than at the other, and is an anaerobic germ. It is constantly present in the dirt of cities and on most country roads, as well as in barns and pastures. Noble has shown that this bacillus occurs in the intestines of otherwise normal animals, and he found the germ in the feces of 11 of 61 horses examined. Further examination of these infected animals showed that the germ could disappear in a few weeks, but could also remain present as long as four months. Such animals become tetanus carriers, and are a constant menace to other animals which may receive injuries. and to their drivers and hostlers, who may have slight wounds on their hands. These tetanus-carrying horses infect the dirt of the fields or streets on which they work or travel.

This bacillus gains entrance to the system almost always through a wound or abrasion, and, as has long been recognized, the most frequently infected wounds are contusions and crushing or lacerating wounds, especially those that occur from sliding, grinding and friction injuries in the streets and from lacerating wounds acquired in warfare, explosions or Fourth of July injuries. At first the infection is a local one, and it is stated that the bacilli do not often wander from the point of infection; but they soon produce their toxins, which cause the general disturbance.

#### SYMPTOMS

The beginning symptoms of poisoning from this germ are aches and pains in the muscles, with a general lassitude, some headache, and soon some stiffness of the muscles of the back of the neck, face and jaw. The wound or source of infection may not show any change; in fact, it may apparently be healed. The more or less permanent contraction of some muscles and the convulsions of tetanus are too well understood to need description. Spasm of the sphincters may make urination and defecation almost impossible. The mind generally remains clear, unless there is very high temperature, which is one of the causes of death. Death may occur during a convulsion from spasm of the diaphraghm or spasm of the laryngeal muscles, or it may occur from exhaustion.

#### THE PREVENTION OF TETANUS

For convenience, the important points in the prophylaxis may be summarized as follows:

- Carefully and thoroughly remove every particle of foreign matter from the wound, laying it open, if necessary, under anesthesia.
- Dry the wound thoroughly, and paint it and the surrounding parts as carefully as possible with tincture of iodine, or else cauterize it thoroughly with a 25 per cent solution of phenol (carbolic acid) in glycerin and alcohol.
- Apply a loose wet pack, using a solution of some antiseptic substance such as boric acid or alcohol.
- 4. As soon as possible, inject intravenously or subcutaneously 1,500 units of antietanic serum and continue the injections, if indications of possible tetanus arise. A special committee appointed in Great Britain to study tetanus as it occurred in the war has recommended that in every instance four prophylactic injections be given at intervals of seven days.
- In no case close the wound. Allow it to heal by granulation. Remove the dressings each day and apply fresh ones.

## TETANUS TOXOID

Tetanus toxoid is a formaldehyde-treated tetanus toxin, incubated for ten days. Of 29 persons given three doses of tetanus toxoid by P. A. T. Sneath (I, A, M, A, A, A), and I the same amounts of antitoxin developed in 28, a titer of at least 0.1 unit per cc. of serum being reached in 20. From five to seven months after the last dose, there was in general a reduction in the antitoxin level, but 27 still showed demonstrable antitoxin, the majority, 25, showing 0.01 unit or more. This is evidence that active immunization with tetanus toxoid might be adopted advantageously by certain groups in whom the hazard of tetanus is greater than in the general population.

# ANTITOXIN IN TETANUS

The use of full doses of antitetanus serum given as soon as the earliest symptoms appear is the measure of greatest importance in the treatment of this disease. The delay of treatment until the second or third day of symptoms, and the small doses (1,500 to 3,000 units) go far toward explaining the failure of older methods to reduce the death rate in this disease.

W. J. Stone (J. A. M. A., June 24, 1922, p. 1939) points out that the antitoxic effect of tetanus antitoxin lasts only from eight to ten days, which is about the usual incubation period of tetanus. However, if the wound contains any necrotic or crushed tissue, the protective dose of antitoxin should be again administered. If any premonitory symptoms of the disease appear, the patient should be saturated with antitoxin before the toxin is fixed in the nerve cells of the spinal cord.

Antitetanic serum injections may cause erythema or other skin eruption, sometimes with joint pains. At times, a reaction may occur some days after the injections. There may be diarrhea, albuminuria and fever from the injections. It is important that the full effect of the antitoxin should be obtained immediately and this may be accomplished by giving 3,000 to 5,000 units intraspinally and 10,000 to 20,000 units intravenously at the earliest possible moment after symptoms of tetanus appear. On the following day, the intraspinal injection may be repeated. The blood will remain strongly antitoxic for several days. On the fourth or fifth day, 10,000 units should be given subcutaneously to maintain the antitoxin content of the blood. If only a small amount of antitoxin (3,000 to 5,000 units) is available, it should be given intraspinally. Intraspinal and intravenous injections should be given with all the precautions usually employed for these methods. Cases have been reported in which as much as 200,000 units of the tetanus antitoxin have been given intravenously, the condition of the patient indicating the need of the serum. Stone thinks that the total amount of the antiserum given should approximate 125,000 units, half of which should be given intraspinally.

Subsequent injections of antitoxin, especially when given intravenously, can cause anaphylaxis, sometimes severe; and Simon thinks that injections later than the tenth day become dangerous from the standpoint of possible production of anaphylactic shock.

The prophylactic dose of tetanus antitoxin should be about 1,500 units, given subcutaneously, preferably in or about the region of the injury, and this should be given whenever the character of the injury or the region in which the injury is received presents any possibility of tetanus infection. This dose can be repeated in a few days, if deemed advisable.

As in administering diphtheria antitoxin, one should ascertain whether the patient is susceptible to emanations from horses or stables; if he has symptoms of hay fever and asthma from such emanations, it is unwise to administer horse serum, especially as a prophylactic for something that may not occur.

Joseph K. Calvin and A. H. Goldberg (J. A. M. A., June 21, 1930, p. 1977) made a study of 183 cases of tetanus. They found that the available evidence in these cases as to the therapeutic use of tetanus antitoxin does not justify any assertion that such use appreciably affects the character of the mortality, whether the serum is given intravenously, intraspinally or by both routes, or whether large doses are given or not, or how early they may be given.

This use of antitoxin in no respect replaces other necessary recognized nonspecific methods of treatment in tetanus. Surgical treatment of the site of infection should be instituted at once. The patient should be placed at rest in bed in a quiet, darkened room. He should receive sufficient sedatives to control convulsions, together with an adequate supply of fluid nourishment and attention to the elimination by kidney and howel

# DRUG THERAPY

Smith and Leighton (Am. J. M. Sc., December 1924, p. 852) discuss the treatment of tetanus with magnesium sulphate. As a prophylactic, they would give tetanus antitoxin, subcutaneously, immediately after an injury has occurred that might cause poisoning with this germ. They would repeat the prophylactic injection in ten days. Besides giving the antitetanic

serum in the usual manner, if the disease of tetanus develops they give subcutaneous injections of magnesium sulphate to control the convulsions. If the symptoms are urgent and the subcutaneous method fails, they advise intraspinal injections of magnesium sulphate. They also would give morphine hypodermically.

The combination of morphine and magnesium sulphate treatment seems unwise, as it would be impossible to note the amount of depression caused by the mag-

nesium sulphate.

The serotherapy by no means does away with the necessity for choral or morphine. The dosage must be proportional to the age of the patient and the severity of the tetanus. Some clinicians give very large doses of chloral, but Permin thinks it is wiser to keep below the maximum dose and supplement the chloral with morphine, keeping the patient in a quiet darkened room. The necessity for large and continued doses of chloral should not blind the physician to the possible danger of giving an overdose. The more powerful effect may sometimes be secured by combining a bromide with chloral.

It is of the utmost importance that the patient should receive adequate nourishment, as the resisting powers depend to a great extent on nutriment. Concentrated fluid foods are best and with extreme lockjaw it may be necessary to resort to feeding through a nasal tube. According to Frederic W. Taylor (J. A. M. A., March 24, 1934, p. 895) treatment of tetanus should be directed along three well defined lines. These are in the order of their importance: adequate care of the local wound, sedative and general care, and tetanus antitoxic serum. If emphasis is to be placed on any particular phase more than on another, he believes that sedatives and the local focus should receive that consideration rather than the use of antitoxin.

Whenever possible, immediate complete excision of the wound is recommended. When this is not possible, complete exposure and search for foreign bodies should

be made under general anesthesia.

Patients with tetanus die from their symptoms and not from the disease itself. If the symptoms can be controlled adequately, the chances for recovery are much greater. Tribromethanol or sodium amytal is recommended to induce light narcosis. The suggestion is also made that these drugs be given at regular intervals so as to keep the patient quiet and relaxed. It is imperative that the fluid intake be maintained at a high level and that proper elimination be effected.

It is recommended that from 30,000 to 60,000 units of teatures antitoxin be given when the patient is first seen. This might be repeated if the case runs a long, protracted course. The intramuscular route of injection is perhans the most satisfactory.

## MALARIA

Malaria, an infectious disease caused by the hemameba or Plasmodium malariae, is a disease marked by chill, fever and sweating periods, and by its response to quinine. While comparatively rare today in most parts of the United States it still takes a large toll of the population in Italy, Russia and in the tropics.

#### ORGANISM

The organisms are the tertian which requires forty-cible hours for development and causes a paroxysm on each third day; the quartan, developing in seventy-two hours and causing paroxysms on each fourth day; the estivo-autumnal, irregular in development and causing the severer types of the disease. The organisms may be sought for in fresh blood on a warm stage, but if such is not available, it is possible to detect them in dried or fixed specimens using Wright's, the Romanowsky or other common stains.

S. T. Darling (Ann. Clin. Med., March 1926, p. 695) quotes the observation of Ross and Thompson that to produce a malarial paroxysm there must be one parasite to each hundred thousand hematids, that is, fitty parasites in 1 c.mm. of blood. It is frequently found that malarial parasites are in the peripheral blood but without causing symptoms; in other words, a tolerance has been established. Also, there are not infrequently clinical symptoms of malaria without plasmodia being demonstrated in the peripheral blood. Perhaps this absence of parasites in the peripheral blood is the result of the administration of quinine, the parasites

remaining in the viscera. Darling believes that the size of the spleen is an indication of the amount of malarial infection that is present in a person. The infection often lies dormant in the spleen and bone marrow during intervals without symptoms, until a relapse occurs. In early cases quinine will reduce the size of the spleen to normal, but if infection is not cured early, the spleen may remain enlarged for long periods of time although it may vary in size, the peripheral blood showing malarial infection intermittently. Darling says that as long as the spleen remains enlarged, with a history of malaria, the disease has not been eradicated. He cautions that in regions where hookworm is prevalent this extra infection may be an important cause of the anemia, the malaria not being the only source. When malaria is constantly present, as in malarial regions, the spleen may become enormous in size.

In outlining a treatment for malarial fevers, the physician must recognize that the treatment in tropical malarial districts and the treatment of the mild malaria in other regions cannot be similar.

#### PREVENTION

The notable work of the United States Army and Public Health Services has shown that this disease may be completely eliminated in any community by the proper measures. It is carried by the female anopheles mosquito. These lay eggs in marshy places, and from these eggs the larvae develop in warm weather after two or three days. The larvae are air breathers and are therefore easily destroyed when petroleum is placed on the surface of the water. Better still is the draining of marshes and breeding places. At the same time human habitations should be screened and while the work of draining and prevention is under way prophylactic doses of quinine should be administered to those likely to be affected.

Exposures to the sun seem to light up latent malarial infection, bringing the plasmodia to the peripheral blood. A large majority of the chills in ordinary intermittent fever occur during the daytime or time of activity, and the greatest number of chills occur about

two o'clock in the afternoon.

# DRUG PROPHYLAXIS IN MALARIA

Most of the drug prophylaxis has been done with quinine. The consensus now is that quinine will not prevent infection but will prevent clinical attacks. Thus, particularly in camps where it is necessary to keep up the efficiency of a group of workers, it is possible to reduce clinical malaria to a minimum over a long period. Many of these individuals, however, will lave contracted the infection so that later after the drug is discontinued, and particularly if their general resistance is lowered, they may have a relapse. Quinine hydrochloride is generally given in doses of 0.3 Gm. daily or I Gm. twice a week. Some authorities suggest from 0.5 to 0.65 Gm. daily or 1 Gm. twice a week.

There is evidence that plasmochin acts as a prophylactic, actually preventing infection, especially in malignant tertian malaria, but many feel that the doses necessary for complete protection are too large to be safe. Some assert that 0.03 Gm. a day can be taken for several months without untoward symptoms and will materially lessen the case rate, especially of malignant tertian malaria. Certainly even small doses are of public health value, because even when they do not materially affect the individual's infection they render the gametocytes nominfective to mosquitoes and are of great ultimate advantage to public health. A safe

orophylactic dose is said to be about 0.018 Gm. So far reports concerning atebrin are few. It is said to destroy curatively all plasmodial forms of benign tertian and quartan malaria but only the schizonts of malignant tertian malaria. It is usually given in doses of 0.1 Gm. three times a day, and in the treatment of malignant tertian malaria 0.01 Gm. of plasmochin is added for the crescents. The course of treatment is from five to ten days. The low toxicity and its tendency to remain for a long time in the body might recommend it for use as a prophylactic, but satisfactory evidence of such usefulness is not yet available. Among side actions that have been reported for atebrin are transient yellow discoloration of the skin and gastro-intestinal disturbances.

In sum, quinine is still of most proved value in the treatment of malaria. Plasmochin has been proved to

be a wonderful adjunct, particularly because of its action on the gametocytes of malignant tertian malaria. Atehrin alone and combined with plasmochin for malignant tertian malaria may be superior to both the preceding, but it is too recent a discovery to permit definite conclusions. Any of the drugs probably will partially control the symptoms without absolute protection against infection.

#### TREATMENT

The general treatment of the patient with malarial fever should be that given for equally severe symptoms in other infectious disease. It includes bed rest. and care of the diet, the bowels and the skin.

During the chill the patient should be given hot drinks in profusion, and hot water bottles should be placed to the feet. Warm coverings and other heating devices may be used. In the stage of fever, he should receive cool sponging, cool drinks, alcohol rubs and similar physical and hydrotherapeutic measures. If there is headache it may be relieved by cold applications to the head, or if intense, by the administration of a small dose of morphine. When perspiration begins the patient should be rubbed with dry towels.

Not only is it advisable to give an ordinary dose of calomel before starting the quinine treatment, but some clinicians advocate the administration of one grain of calomel every night for a time, coincident with the quinine treatment. If the bowels do not act well, a mild saline laxative should be given in the morning.

#### OUININE

There are numerous methods of administering quinine to these patients and practically every physician who has treated these conditions extensively has special

methods of his own.

Mayne and Carter working under the auspices of the United States Public Health Service have endeavored to outline a standard form of therapy which will insure the giving of a sufficient dosage of quinine. The greatest dereliction consists in the insufficiency of the dosage and the aborted length of treatment. They recommend the administration of 800 grains (52 Gm.) of quinine bisulphate over a minimum

period of seventy-five days. For the first five days 10 grains (0.65 Gm.) of quinine bisulphate are given four times daily. At the end of this period there should be no severe paroxysms, no chills, and only young rings and mature gametocytes in the blood. For the next ten days 5 grains (0.32 Gm.) of quinine bisulphate are given four times daily, About the middle of this stage the patient, who should have been in bed, will probably be out of bed and clinically and apparently normal. With the exception of the gametocytes the parasites will not be demonstrable microscopically in the blood. The patient should then be able to resume his normal activities. For the next twenty days, however, he may receive 2½ grains (0.16 Gm.) of quinine bisulphate every four hours and arsenic in the form of solution of potassium arsenite or some tonic may be prescribed. Finally for a period of forty days 5 grains (0.32 Gm.) of quinine bisulphate should be taken daily, with a tonic, if the patient seems to require it. It is understood, of course, that the treatment must be modified to suit the individual case. In young adults or chronic cases in older persons the dosage indicated might not be wholly desirable.

During the acute attack it may be better to wait until the rigor and hot stages are over and the patient is beginning to perspire before giving quinine. If quinine is given during the early stages it may aggravate the headache

It must be understood that some persons suffer intensely with an idiosyncrasy to quinine. Among the serious symptoms are urticaria and quinine amblyopia or blindness, in some cases accompanied by dizziness and mental confusion. Some patients are unable to retain quinine in the stomach and vomit profusely. In such instances rectal administration should be considered and if neither of these methods is suitable, the patient may be given quinine intravenously.

When quinine is given by enema, the dose should be a large one, possibly 30 grains (1.95 Gm.), and it may be repeated in one or two hours. In children 5 grains (0.32 Gm.) may be given in a solution of warm water. When quinine is to be given intravenously Manson recommends the use of the dibydrochloride in doses

of from 10 to 15 grains (0.65 to 1 Gm.) dissolved in 10 cc. of physiologic sodium chloride solution and then boiled. It should be injected into a vein at the bend of the elbow, as is usually done with arsphenamine. The injection is to be made slowly and at least three minutes spent in giving the entire volume.

In cases of pernicious malaria, quinine may be given, in suitable preparations, intramuscularly and rarely intravenously. As there may be marked idiosyncrasy to quinine, the intravenous method may be used only when it seems absolutely necessary and when previous inquiry has elicited the fact that there are no contra-indications.

#### PLASMOCHIN

Plasmochin is a synthetic derivative of quinoline. J. A. Sinton and his associates (Indian J. M. Research, January 1930, p. 793) find that plasmochin is an important adjuvant to quinine treatment and should not be used except in combination with that drug. The daily dose of quinine to be given with plasmochin should not be less than 1.25 Gm. (20 grains). Continuous treatment with plasmochin in small doses combined with quinine produces a greater number of permanent cures than larger doses given by the interrupted method but is liable to produce toxic symptoms. Doses of plasmochin greater than 0.04 Gm. should not be given daily, and possibly even 0.03 Gm. or less will be found to be the maximum safe daily dose. Plasmochin treatment should not be given, excepting with extreme caution, to persons suffering with lesions of the liver, kidneys and circulatory system.

#### ATABRINE

In recent years, atabrine a synthetic compound has been used extensively in tropical countries, in treating malaria, apparently with very favorable results. This product is an alkyl amino-acridine derivative.

E. Appelbaum and B. B. Gelfand (J. A. M. A., May 19, 1934, p. 1664) gave this product by mouth to 3 patients with malaria and administered it intravenously to 3 others. There was rapid improvement after its use. The atabrine failed to destroy the estivo-autumnal gametocytes. The drug is not unpleasant to take and is not a depressant.

# SEQUELAE OF MALARIA

In the treatment of chronic malaria and its sequelae, medicine is only of secondary importance. Residence in a healthful climate—preferably the mountains—good nourishment, a quiet life and moderate exercise are the dominant considerations. Spices and alcohol should be avoided, as they are liver irritants. Iron and arsenic are useful for the anemia. Sodium methylarsenate probably acts chiefly as a blood restorer and in reasonable doses would not be contraindicated by malarial hypertrophy of the liver. Its chief toxic effects are exerted on the gastro-intestinal mucosa when it is given by mouth, and on the nervous system (especially the optic nerve) and the kidneys when given by injection.

Saccharated ferrous carbonate, which contains 15 per cent of the iron salt, is a good prescription for iron in powder form. Reduced iron is a good preparation to prescribe in pill form, 6 Gm. of reduced iron being divided into thirty pills and one taken three times a day after meals. As it is 90 per cent metallic iron, it furnishes more iron for possible absorption than does the carbonate. Iron injected intravenously does not exert a more powerful hematinic action than does iron given by mouth but it is much more toxic. Iron cacodylate is quite toxic when given intravenously and causes severe local reactions when injected hypodermically. It offers no special advantages over other methods of iron and arsenic administration. It one wants to give arsenic with iron, a dose of 0.002 Gm. of arsenic trioxide might be added to each of the pills of reduced iron, or 0.06 Gm. to the prescription for thirty pills.

# TUBERCULOSIS

Under the general title of tuberculosis are included the various pulmonary and abdominal forms, and tuberculosis of the bones, glands and other organs of the body. This is a disease of civilization and hence spreads because of the congregation and crowding of mankind into small regions, such as cities. Thousands of persons suffering from pulmonary tuberculosis are walking our streets and expectorating billions of tuberce bacilit daily.

S. A. Petroff (J. A. M. A., July 23, 1927, p. 285) declares that, "The tubercle bacillus does not propagate outside the body. Its existence depends on the parasitic part it plays in the human body." He says that live bacilli should not be used for immunization but "dead tubercle bacilli or some of their derivatives can be used safely and effectively in immunizing the human race."

#### ETIOLOGY

The discovery of the tubercle bacillus by Robert Koch, in 1882, and the proof that this bacillus was the cause of tuberculosis, changed the established belief that tuberculosis was hereditary to the belief that it must always be acquired. This is of course a fact, but the part that heredity plays in the development of tuberculosis, in furnishing proper ground in which the bacillus may grow, or in offering a condition of low-grade inmunity against this disease is progressively becoming more prominent. A human fetus can be born with tuberculosis, but comparatively few such cases have been recorded.

Statistics show that the person who is underweight and has a family history of tuberculosis is more likely to develop the disease than one who is underweight without a family history of tuberculosis. On the other hand, a person of full weight or overweight, whatever the family history, while not precluded from the possibility of developing tuberculosis, is much less likely to have it than one who is underweight. Also, one who is underweight is more likely to develop tuberculosis than a person of normal weight. Whether or not the majority of underweight persons harbor tuberculosis germs and such a condition predisposes to underweight has not been demonstrated, but it is possible.

As is apparently true of most germ diseases, a race that has but recently acquired the disease is more susceptible to its inroads, and has the disease more actively than a race that has long suffered from it. Also, a change from outdoor life and an environment with dry, clean air to indoor or to city life, or to a region where the air is damp or dust-laden, predisposes to the development of tuberculosis.

These bacilli almost invariably gain entrance to the system by one of two ways: by inhalation, as occurs

in the majority of cases, or by swallowing. A germ that is so constantly present in almost every community of civilized peoples must be breathed and swallowed by most persons. Something in the individual must tend to kill these germs before they acquire a home, that is, before they congregate in sufficient numbers to perpetuate themselves. Probably nothing tends more to prevent the acquirement of this disease than general good health, which especially means health of the upper air passages and throat, healthy tonsils, normal digestion and healthy intestines and the absence of bronchial catarrh. The evidence that the tonsils may be a portal of entry seems to be definite and very conclusive. The tubercle bacillus probably cannot live unless there is some disease, injury or chronic disturbance in one of the parts of the body mentioned, and unless a sufficiently large number of these bacilli are inhaled or swallowed at once, so as almost to overwhelm the person's ability to destroy the germ. Of course, it is possible and perhaps probable that, although this disease gives no immunity, a patient in whom the disease has been arrested or in whom the disease once active is now chronic or more or less latent, may produce, or have already circulating in the body fluids, enzymes that may destroy the tubercle bacillus more readily than is possible in one who has never had the disease.

Perhaps many conditions that we have termed causes predisposing to tuberculosis may really stimulate to activity latent tuberculosis or a tuberculous focus harbored and concealed somewhere in the patient's body. Whichever of these two suppositions may be correct, we recognize that a patient is likely to acquire, or having acquired, at least may develop an active tuberculous process when he is anemic; when he is underweight; when he is continuously overfatigued; when he has a tendency to recurrent colds, especially to recurrent bronchitis; when he does not quickly recuperate from any simple acute infection, whether it be grip, measles or whooping cough, or when he has suffered from a more serious acute infection, such as some prolonged septic process or typhoid, and especially when he does not recover quickly from a pneumonia or a pleurisy with effusion.

Pleuritic effusions are considered as perhaps generally tuberculous in origin. None of the surrounding predisposing causes, such as unsatisfactory housing conditions and occupations that are dangerously dusty, need be considered here.

A child is considered predisposed to the development of tuberculosis, or perhaps already has latent tuberculosis, if he is pale, has a tendency to eczema, or has enlarged tonsils or postnasal adenoids, and especially if he has enlarged cervical glands. An enlarged cervical gland probably always shows that an infection entering through the tonsil has invaded the next fortress of protection, namely, the cervical glands. If the infection is tuberculosis, the gland may be actively tuberculous, and evident tuberculous adenitis is the condition. Much more frequent and less evident, but often found by good roentgenograms of the chests of children, is the involvement of the bronchial glands by the tuberculous germ. It perhaps first gained entrance through the tonsils, and this without any involvement of the cervical glands. In fact, it has been repeatedly demonstrated that perhaps the majority of children affected with tuberculosis have the initial lesion in the tracheobronchial and hilus glands.

Bovine tuberculosis is frequently transmitted to childram through milk by way of the intestine, and many instances of glandular tuberculosis are due to this type of bacillus. General tuberculosis rarely, but udder tuberculosis almost always, infects milk with tubercle bacilli. The frequency with which milk thus infected causes tuberculosis in children is still more or less a

subject of dispute.

Éugene L. Ôpie (J. A. M. A., Oct. 18, 1930, p. 1151) insists that the discovery of advanced tuberculosis in children is by no means easy and requires a staff adequately trained in the use of technical procedures applicable to its detection. In the search for tuberculous infection, two procedures are available: (1) examination by tuberculin tests and roentgenologic examination of all children known to be exposed to open tuberculosis; (2) roentgenologic examination of school children who react to tuberculin, precedence being given to groups of children, such as adolescent

girls and Negro children, among whom the disease is

One hundred and thirty-two Negro families were

included in a study of tuberculosis made by J. A. Crabtree. He found that households that have contained cases of tuberculosis and more especially fatal or existing active cases are more crowded, families are larger, and the rental value of residences is lower than those with no tuberculosis; milk consumption per capita is considerably lower and evidence of fith and untidiness in the home is three times more frequent in the former class of household than in the latter.

The data with respect to occupation show no unusual prevalence of tuberculosis in any occupational group

except that classed as day laborers.

In seventy-five mothers in these households, considered only during the child-bearing period, cases of tuberculosis have occurred four times and death eleven times more frequently during the one year period immediately following childbirth than during other times. Three per cent of cases of recorded influenza, six per cent of pneumonia and nineteen per cent of pleurisy were followed within a year by tuberculosis. One fourth of the total non-fatal cases of tuberculosis date the onset of the disease during the year following an attack of influenza and more than one half of the cases are thus associated with either influenza, pneumonia or pleurisy.

# SIGNIFICANCE OF TUBERCULOUS INFECTION IN SCHOOL CHILDREN

Demonstrable tuberculous infection with the following characteristics is prevalent among healthy children and requires no special care to prevent its further development:

 Infection revealed by the tuberculin test with no lesion demonstrable by roentgenologic examination.

Circumscribed pulmonary nodules that have undergone calcification.
 Roentgenographically demonstrable tuberculosis of

tracheobronchial lymph nodes, with certain exceptions.

Children with the following conditions are in danger of tuberculosis that will undermine health and should

receive special care in open air schools, preventoriums or by other means to prevent further progress of the disease:

- Latent tuberculous infiltration of the childhood type evident in roentgenograms, often associated with tuberculosis of the tracheobronchial glands. In some instances, particularly in older children, these lesions are the scars of healed infection and do not require spe-
- cial care.

  2. Tuberculosis of tracheobronchial lymph nodes with some calcification, recognizable by roentgenologic examination, (a) when the child is still in contact with open tuberculosis, (b) when the tuberculin reaction is intense, (c) when the lesions are unusually large or very numerous.

3. Latent tuberculosis of the adult type.

- 4. Arrested tuberculosis, notably in children who have been in sanatoriums.
- 5. An active tuberculin reaction or an otherwise negligible tuberculous lesion recognized by roentgenologic examination in association with impaired health and conspicuous underweight.

#### PROPHYLACTIC MEASURES

Measures that will cause a decrease in the incidence of this disease may be enumerated as, primarily:

1. General instruction in hygiene and in the con-

ditions that predispose to this disease.

Tenement house laws to prevent overcrowding.
 Sunlight.

Open windows, verandas and roof-gardens.

- 5. Municipal breathing spaces, as parks and playgrounds.
- Comparison of all churches, theaters, halls, and assembly rooms.
  - 7. Open air schools, or open window schools.
- 8. Laws prohibiting spitting on the streets and on the floors of buildings.

Better factory sanitation; better methods of cleaning public buildings and public conveyances.

 Special laws against the dissemination of dust in factories, foundries and all occupations in which it may be inhaled. 11. Better hygiene and improved buildings for all general hospitals, prisons and jails.

general hospitals, prisons and jails.

12. Better laws for the more scientific control of tuberculous cattle, and compulsory cleaning and improving of cow barns and farms used for producing

public milk supplies.

13. Certification or pasteurizing of all milk used

for infant feeding.

 Exclusion of young children, if possible, from living in apartments which house persons with active pulmonary tuberculosis.

Personal preventive measures are:

 Compulsory reporting of every case of tuberculosis.

 Careful instruction of the family in the care of the tuberculous person, if he is to remain at home.

Careful personal instruction of the patient, if he
is at an age to receive it, as to the possible methods of
communicating the disease to others.

Sanatoriums for incipient cases of pulmonary

tubergularia.

tuberculosis.
5. Isolation hospitals for patients with advanced

tuberculosis whose home surroundings are inadequate.

6. Skilled dispensary care of ambulatory cases and

visiting nurses for follow-up work.

7. Šanatoriums or rest hospitals for joint and bone tuberculosis; these are of special value when located at the seaside. (The value in glandular and bone tuberculosis of seaside sanatorium and sun cures must be recognized.) Strong winds, and especially winds carrying moisture, are particularly bad for tuberculous patients. These patients should always obtain their fresh air under proper shelter.

8. Careful instruction to reduce the morbid fear of other members of the family, and for the mental comfort and happiness of the patient. This should be given, both by the board of health and by the attending physician. These should impress on all concerned that the disease is not contagious, and that if the instructions urged are properly carried out the probability of acquiring the disease from the patient is practically nil.

9. It has long been known that pregnancy in a tuberculous woman is a dangerous complication. Though she may appear to have better health during the pregnancy, a fatal consequence may follow rapidly after parturition.

# PRETUBERCULOUS SYMPTOMS

The earlier the signs of probable or even possible tuberculosis are recognized, the better, as prevention is far easier than cure, though a cure is probable all through the first and second stages, and possible even in the third stage of the disease.

The conditions which predispose to this disease have already been enumerated. Besides correcting these conditions, we should use every means to build up the general system of the patient by tonics, outdoor life, change of climate, and by proper tepid or cold water

sponging in the morning.

At a very early stage there may not be any lung signs, and it may be impossible to determine whether or not the bronchial lymph nodes are enlarged or diseased. There is loss of weight, more or less gastric disturbance, pallor, lassitude and vasomotor disturbance shown by cold hands and feet, with intermittent periods during which the latter may be very hot and dry. There is gen-erally a history of progressive loss of weight, irregular chest pains, shallow breathing, dry cough, especially on deep inspiration, and, most important symptom of all, an afternoon or evening rise of temperature, not explainable by any tangible cause (although it must not be forgotten that occasionally such a temperature can be due to focal infection or of nervous origin). Gastric indigestion, with loss of appetite, is often an early symptom of pulmonary tuberculosis. An anal fistula is generally secondary, and is not often primary to the lung lesion, and the discharge from it may contain tubercle bacilli, as well as staphylococci and streptococci. There may be some other chronic suppuration present, as infection in the middle ear. While anemia is generally an early symptom, in the first stages there may be an increase in the number of the red blood corpuscles. In girls and women suffering from tuberculosis after the age of puberty the ovarian activities are almost invariably impaired, and amenorrhea, even without anemia, is generally an early symptom. Women may complete one, or even two, pregnancies while tuberculous.

While the physician is studying every symptom, and the full symptoms are few, to ascertain whether the patient really is tuberculous, it should be remembered that a personal history of much sickness, especially colds, enlarged glands, chronic joint and tendon swellings or recurrent diarrhea, even if there has not been any actual pulmonary tuberculosis in the immediate family, has increased the tendency to tuberculous infections.

tion and hence its presence is probable.

In making the physical examination it should be remembered that it has long been decided that the flat, broad chest, contrary to previous belief, is less likely to be tuberculous than the rounded, barrel-shaped chest. Also, the chest circumference in the nipple line should measure anatomically half the height of the person. The expansion, unless the patient is abdominally obese, should be from 21/2 to 4 inches; 2 inches, though accepted by army requirements, is a very small expansion for a young adult. The inspection of the chest may show a lagging of one side during expansion. which may, however, be most noticeable with the finger tips placed under the clavicles. This sign is very suggestive. The vital capacity of the lungs decreases with the progress of pulmonary tuberculosis. It may not be impaired in early cases. The typical impaired percussion note, imperfect breeziness of the inspiratory murmur, lessened depth, slightly jerky inspiration, slightly prolonged expiration, slightly increased vocal resonance and localized râles, either dry or moist, with increased muscle resistance over a diseased area and with pleuritic pains in the upper part of the chest or between the shoulder blades, are all too well understood to require elaboration. Very suggestive is the axillary, dripping perspiration during examination. Also suggestive is the little dry cough during the required increased inspiratory effort. This dry cough, hardly noticed by the patient, has probably been observed for weeks, if not longer, by the patient's family. In incipient tuberculous condition of the lungs one examination is not sufficient to enable one to come to a conclusion as to the exact condition present. Roentgen examinations are of great diagnostic value, but these pictures should always be correlated with the physical observations and with the symptoms.

A study of the temperature of the suspected person is important; the temperature should be taken every three hours during the day for several days; or at least at 8 o'clock in the morning, at 4 in the afternoon, and at 8 in the evening, if not more frequently. A recurrent rise of temperature in the afternoon or evening. without any assignable cause, is almost pathognomonic of a latent tuberculosis becoming active. Some patients who show no fever when at rest will have quite a rise of temperature on the least exercise. Temperatures taken under the tongue are not as accurate as when properly taken in the axilla. Many a patient whose temperature is normal by the mouth will be found to have a higher temperature in the axilla. Of course, the most accurate is the rectal temperature, but this is rarely necessary for the diagnosis. An increased pulse rate, over 100, with or without rise of temperature, unless there is hyperthyroidism, is very suggestive, and if the pulse rate is higher than the temperature would call for, the likelihood of tuberculosis is increased.

It is commonly believed that women with tuberculosis show a cyclic exacerbation of fever at the menstrual period. E. M. Jameson and his associates (J. A. M. A., July 5, 1930, p. 13) found in 363 women who were discharged with the disease apparently arrested or improved that 424 per cent had some premenstrual

rise in temperature.

M. M. Weiss (Am. J. M. Sc., May 1930, p. 699), after a systematic study of 100 patients, concluded that fever associated with menstruation has been found in normal women and in diseases other than tuberculosis. It cannot be identified as a characteristic entity in the latter disease; a diagnosis of tuberculosis cannot be

made from the temperature curve alone.

A slight hemorrhage of arterial blood from the mouth always causes the laity to suspect phthisis, and the suspicion is quite generally correct. However, hemorrhages occur also from the blood vessels of the throat and larynx, although they are generally very small in amount, and most frequently venous, and many a patient has been condemned to treatment for tuberculosis on account of a perfectly simple throat hemorrhage. The occurrence of typical night sweats, that is, cold sweats toward morning, is a frequent and suggestive symptom of tuberculosis; but patients who have been weakened by illness, overwork, or overexertion may have this symptom for a short time. However, it should always create suspicion. The night sweats in these conditions may be due to suprarenal insufficiency and, if so, are generally stopped by giving suprarenal substratore.

Rarely noted symptoms of tuberculosis, which may occur early in the disease or not until later, are atrophy of the mammary gland on the affected side: also, the hand and foot may be colder on the side affected, or if they are hot and dry, may be warmer than on the other side of the body. Conjunctivitis, blepharitis and an inequality of pupils, with dilatation of the pupil on the same side as the affected lung, have been noted. The skin of the tuberculous patient is often dry, and may be rough and sallow; there may be increased pigmentation, especially around the nipple on the diseased side, and there may be chloasmic spots. The bright red spots on the cheeks, and the glistening eyes occurring in the late afternoon, with the hands dry and hot, are almost pathognomonic. At other times of the day there is pallor, with the veins prominent all over the body; the face looks sad, and there is languor and a rapid, collapsing pulse. These are all signs that may occur at an early period.

Before deciding that the sputum of a suspected patient, or a patient who has incipient tubercules is, is free from tubercle bacilli, several examinations must be made. The sputum may be found free from bacilli on several days, and then on the last day of the examination found to be loaded with them. The number of bacilli found has no great bearing on the prognosis of the disease. On the other hand, if large numbers of tubercle bacilli continue to be present after considerable periods, probably cavitation is either present or developing. The prognosis can hardly be determined from the character or appearance of the tubercle bacilli, Many patients with active tuberculosis of the lungs are free for months of tubercle bacilli in the sputum.

Very suggestive of tuberculosis is the finding on fluoroscopic examination of the chest, even before clouding of any portion of the lung occurs, of diminished excursion of the diaphragm on the affected side. Roentgenograms may show areas of beginning lung trouble as well as diseased bronchial glands.

#### THE TURERCULIN TEST AND TREATMENT

The tuberculin used in making the test for tuberculosis is a purified extract prepared from tubercle bacilli, Its injection causes a leukocytosis and stimulates the production of ferments, especially in the cells and tissues immediately surrounding the tubercles.

These ferments then act on the poisons that have been produced by the tubercle bacilli and have accumulated in the tubercles

The fever reaction is due to the toxins set free from the tubercles and to the action of the enzymes on these toxins. If some form of tuberculin is used for curative purposes, the reactions will become less and less, as more of these sealed-in toxins are set free. Also, reaction may be less as the system becomes less sensitive and hence immune to the irritation of these toxins. It can readily be seen that if too large doses of tuberculin are administered either as a diagnostic test or as a curative treatment, such a large amount of these toxins might be liberated as to cause an intense fever reaction, to the disadvantage of the patient. Also, it is quite possible by such treatment to liberate live tubercle bacilli and cause general infection. Hence, the greatest possible care should be exercised in using tuberculin, either as a test or as a treatment, and the first doses should be of minimum amounts.

As tubercle bacilli are not readily killed by leukocytes, the latter surround the mass of bacilli and disintegrating and caseous material; the resulting lesion is called a tubercle. The fight, then, of enzymes and toxins goes on between the two opposing factions. Some of the leukocytes and some of the bacteria die. with the production of toxins and enzymes. If these are liberated by the local inflammatory process the fever reaction and the other concomitant symptoms occur in the person, if a sufficient amount of the toxin circulates in the blood. Every tubercle that breaks down and is evacuated into the bronchial tubes and expectorated is a step toward recovery. This satis-

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factory process, however, cannot go on without a general disturbance of the patient, with loss of appetite, loss of weight and emaciation, and it becomes a question whether the person can stand the disease until the tubercles are evacuated, and whether or not such evacuation will produce cavitation. The object of tuberculin treatment is to aid the patient slowly to eliminate the tubercles when the disease within him has come to a standstill, and he shows no tendency to recovery, even if he is not growing worse. The theoretical object, then, aimed at by treatment is the elimination by the patient of most of the tubercles, or the permanent encapsulation of those not eliminated by such fibrous and calcareous material as will cause them to be forever outside of the body, as far as any relationship to the blood and lymphatic circulation is concerned. On the other hand, if too many tubercles are broken down at once, too persistently or too continuously, the prognosis is bad, and tuberculin is not indicated

Our conclusions as to the subcutaneous tuberculin test may be as follows: 1. It is a reliable test, and is pathognomonic in children and young adults. In older adults, if the test is positive, it may be relied on as showing a tuberculous focus somewhere, but if the test is negative it is not so reliable as in children. 2. It should not be used carelessly; however, it is perfectly safe if the beginning dose is small. 3. The tuberculin test is unnecessary when a localized pulmonary lesion has been discovered by physical examination. 4. When it is recognized that a patient is tuberculous or is likely to become so, although we do not find any physical lesions, the tuberculin test is unnecessary, as the preventive treatment should be the same whether reaction is positive or negative. 5. In doubtful bone, tendon or joint inflammations, or when for any reason a decision must positively be made, the tuberculin test should be used.

Although a reaction from tuberculin has occurred in cases of carcinoma, sphilis and actinomycosis, still, these instances are so rare that there is the probability that such patients had a latent tuberculosis, and hence the test may be considered positive. In advanced cases of tuberculosis, however, the test may be negative on account of an acquired tolerance to the toxins.

ecount of an acquired tolerance to the toxii

The beginning dose of "old tuberculin" for diagnostic injection is 0.1 mg, the second dose should be 1 mg, the third may be 3 mg, and the fourth 5 or 6 mg. A reaction occurring with any dilution renders another injection inadvisable. A suspected patient not reacting to 5 or 6 mg, should be considered free from tuberculosis.

A physician may secure the old tuberculin, properly diluted for the diagnostic test, directly from the serum

and bacterin manufacturers.

The tuberculin injection test should be used only with a patient who is at rest and does not have a morning rise of temperature as shown by a series of observations. The injection should be given at about 9 p. m., and if there is a rise of temperature in the early morning, it should be considered a positive reaction. If there is pain, swelling or heat discovered at an external suspected area, as a joint, or if congestion or moist risles are discovered in a suspected area of lung tissue, the reaction is a focal one. If there is a marked reaction at the region of the injection (the local reaction), even if there is not a general reaction, the patient probably has tuberculosis, and it may often be unnecessary to continue the injection of stronger dilutions.

The "intradermal" tuberculin test for the diagnosis of latent or concealed tuberculosis is now frequently used. The advantage of this test over the Pirquetus and the Moro skin tests is that a known amount of tuberculin is injected between the layers of the skin. The reaction is a local one, and there is no general disturbance like that occurring with the subcutaneous tuberculin test.

## GENERAL MEDICATION IN THE TREATMENT OF TUBERCULOSIS

Drugs, as such, cannot cure, and are not antidotes to this disease. On the other hand, much can be done, with proper medication, to aid the physiologic process.

Calcium.—It has long been thought that patients suffering from tuberculosis have previously become demineralized. This means especially that they have lost their calcium, and perhaps phosphorus, equilibrium. It is true that tuberculous lesions heal by more

or less calcification. Also, patients are more likely to have hemorrhages if the calcium content of the blood is diminished. Certain it is that patients, especially children, often improve with increased amounts of calcium in their food or as a medicament. One of the great values of a proper amount of milk for tuberculous patients is probably the calcium and phosphate content.

In general, the evidence has not borne out the early enthusiasm for such therapy, although it may have a limited field of usefulness. Mayer and Wells concluded that there is no acceptable clinical evidence for the value of calcium therapy in tuberculosis. Their animal experiments failed to show that calcium therapy favorably affected the course of the disease. Calcium compounds have been used in tuberculosis to remedy calcium deficiency, to lessen inflammatory exudate, to favor calcification of lesions and to lessens sweating and diarrhea; but it is not considered an essential remedy by critical students of the subject.

Creosote.—Creosote was long recommended and much used, and its action in tuberculosis has been lauded by able medical men. Its value, however, is doubtful and its disadvantages many.

Cod Liver Oil.—This oil is a food containing essential vitamins which are of value in the treatment of tuberculosis and are preventive of rickets. A small dose of cod liver oil is as easily taken as a large dose of some emulsion which contains but little of the oil. Other oils and fats are of benefit, particularly butter. There is no difference in the effect of Norwegian ood liver oil, and the oil prepared on our own shores. There are now available imnumerable preparations of cod liver oil, of halibut liver oil, of cod liver oil extracts, and concentrates, and preparations of vitamin D such as viosterol which the physician may prescribe as he thinks desirable.

The Hypophosphites.—There is no chemical, physiologic or specific excuse for giving the hypophosphites the treatment of lung conditions with hypophosphites is a fallacy. This does not mean that some phosphorus and some calcium-bearing preparations and foods containing these elements may not be of value, but one is not justified in expecting results from any hypobosphites.

Arsenic.-Arsenic has been advised for years in many lung conditions. It has been stated that the arsenic eaters of France and Switzerland have been more or less immune from tuberculosis. It has also been said that patients breathe more freely and better under the influence of arsenic. However this may be in the treatment of pulmonary tuberculosis the value of arsenic is very slight. It seems to stimulate the production of blood corpuscles, both red and white, and in small doses it may stimulate the appetite. In large doses arsenic is harmful, as it tends to cause destruction of red blood corpuscles, to irritate the kidneys and to upset the digestion; when pushed, it may cause multiple neuritis. In other words, arsenic is a poison, and should not be administered to a patient unless there is a tangible, positive indication.

Iodine.—For many years this element in some form has been given frequently for various kinds of tuber-culosis, especially of the glandular type. As the thyroid is generally disturbed in tuberculosis, iodine in small

doses may be of benefit.

Harm has been done in pulmonary tuberculosis by the administration of an iodied. It seems to be a stimulant to the tubercles, not unlike tuberculin, and may cause a lighting up of a quiescent tuberculous process or a serious exacerbation of a slow-going infection. The stimulant action on glands is well known, and tuberculous glands may be overstimulated to the harm of the patient. In other words, iodides should not be used carelessly in pulmonary and glandular tuberculosis. This does not militate against the possibility of small, very slowly increasing doses of iodine doing the same good that graded doses of tuberculin do, but the treatment should be most carefully watched.

Insulin.—Frederick M. Allen (I. Á. M. A., Dec. 2, 1933, p. 1797) observes that in a large number of cases of tuberculosis ranging from quiescent to severe, the proper use of insulin produced marked gains of weight, strength and spirits. Insulin is not a specific antibody or cure for tuberculosis and is not expected to save inherently hopeless cases.

Tuberculin.—Tuberculin is not in itself curative, but it is, at most, a stimulant to the curative efforts of the

organism. Many observers are of the opinion that it is of value in selected cases of tuberculosis. The potency of tuberculin for harm is recognized by all. Its administration requires careful selection of the case, close observation of the patient and appropriate regulation of the dose. Patients should be treated in a hospital, or, if the remedy is administered to ambulant patients, a strict control should be exercised. The results are frequently good in the forms of localized tuberculosis, such as affect the skin, homes, joints, lymph nodes and larynx. Tuberculosis of the lungs, when strictly localized, would appear to indicate its use, but the different character of the tissue involved seems to render the results less favorable.

Heliotherapy .- Treatment by the direct rays of the sun has been applied by Rollier of Leysin, especially in cases of pulmonary tuberculosis complicated by local tuberculosis of the bones, joints or glands. It is being used more and more in ordinary cases of pulmonary tuberculosis. It should be applied with caution, where there is fever or a tendency to hemoptysis, It consists in graduated exposure of the body to the light of the sun for increasing periods, daily, until the resistance developed permits a long stay in the open air. This procedure is well borne by children. During the treatment the head should be protected and the room should be comfortable for the patient. As stated by Pottenger, in all nontoxic conditions exposure to the direct rays of the sun is of great value. This procedure may not have any specific effect, but it is probably one of the best measures that we have for improving the general reactions of the patient. The value of open air and sunlight is enhanced by accustoming the patient to little clothing, and by exposing the naked skin to air and sunlight. Full sunlight for a portion of each day may be given to all nonfebrile patients and even to some who have slight elevation of temperature. On the local lesions sunlight has at first a direct effect. When this treatment is given: 1. The patient's head must always be protected. 2. The patient must never be allowed to become too cold or too hot. 3. On the first day the legs to the knees may be exposed hourly for five minutes. If this is tolerated well, exposure of the knees may last for ten minutes hourly. On the third day

exposure of the thighs for ten minutes hourly, and on the fourth day, similar exposure for fifteen minutes is advised. On the fifth day exposure of the thighs for fifteen minutes and of the body for five minutes is desirable. On the sixth day exposure of the thighs for fifteen minutes and of the body for ten minutes hourly may be attempted. If the skin is pigmented, the periods of exposure may be gradually increased, until the patient may be completely exposed for periods, and when pigmentation is fully established continuous exposure may be undertaken. 4. Blistering must be carefully avoided. 5. If the temperature exceeds 100 F. the patient should not be exposed the following day. unless special orders are given. 6. Sinuses should be exposed and any purulent discharge from them should be immediately swabbed. 7. A nurse must be on duty during the whole time. Bone and joint tuberculosis seem to be the forms that are most benefited by the direct sunlight, probably by increasing general metabolism and also by increasing the calcium content of the blood. It should be noted that it is not easy to diagnose a joint disturbance as tuberculous. Consequently, it is often necessary to aspirate some secretion from a joint and inject it into a guinea-pig. It may be advisable carefully to carry out the tuberculin test on the patient. The improvement in the tuberculous joint under sunlight treatment is made evident by repeated roentgenograms. Tuberculous lymph glands are benefited, old tuberculous sinuses are healed, and effusions into joints or into the pleural cavities seem to be more rapidly absorbed under the sun treatment. The increase in the lymphocytes may be one of the benefits of the sun treatment; it has long been known that a goodly number of lymphocytes is desirable in tuberculosis. At times, it has seemed that too intense, or not well regulated, sun baths have caused hemorrhage from the lungs in pulmonary cases. A patient who is having hemorrhages should not, ordinarily, receive these treatments, but if the bleeding is slight, the increase of the blood calcium caused by sun baths would seem of value. In bone tuberculosis, it was at first considered that the rays should be directed especially to the diseased part, but it has now been found that irradiation of the whole body is more beneficial. Children under these treatments

who do not become pigmented are not as much benefited as those who become well bronzed.

R. H. McCutcheon (Am. Rev. Tuberc., April 1925. p. 85) reports his experience in the treatment of 105 cases of tuberculosis by heliotherapy. In nearly half the cases the lung moisture was decreased, and in more than half the cough was either stopped or greatly decreased. Expectoration seems to be increased for an hour or two after each period of treatment, but the amount is diminished for the rest of the day. The patients slept better and their appetites were generally increased, and he did not find that the treatment caused hemorrhage.

As light from the sun is not always available, quartz mercury arc lamps have been substituted in some institutions for the administration of the light treat-These lamps impart the ultraviolet rays. Stronger doses of this treatment may be given than with sunlight, but thin skinned individuals, and therefore children, are very susceptible to any of these exposures. It should further be noted that too much sunlight may increase the activity in a tuberculous focus

## SUNLIGHT IN GLANDULAR TUBERCULOSIS

Taking it for granted that the diagnosis of adult lymph node tuberculosis is certain, if high fever exists one would sacrifice solar exposures for complete bed rest under circumstances in which it is necessary to

leave the bed to reach the sun rays.

Otherwise, solar exposures vary greatly, depending on many factors, such as location, altitude, humidity, season of year, time of day, general condition of patient, presence of complicating pulmonary tuberculosis and whether the patient is of marked blond or brunette type. The rate of increase of dosage will vary with skin reactions as well as constitutional ones.

In temperate zones, during the spring, adult patients not acutely and progressively ill may be exposed in a room not chilly between 10 a. m. and noon and between 2 and 4 p. m. In hotter months, one should avoid the depressing heat between 11 a. m. and 2:30 to 3 p. m.

One should aim for a mild skin redness at the start and expose daily or every other day, depending on the reactions. The patient should feel as well during and after exposures as before. Reaction of depression, irritability, fatigue or undue prolonged elevation of temperature indicates stopping exposures for a while at least.

Recognizing these factors, one may start safely with five or ten minutes' exposure front and back morning and afternoon. The reaction should be studied and the exposure increased by five minutes daily up to two hours daily. The exposures should be broken up into morning and afternoon periods.

If marked pigmentation results and the patient thrives, an exposure of three hours should be the

#### CLIMATE IN TUBERCULOSIS

- S. Adolphus Knopf (J. A. M. A., June 13, 1931, p. 2023) suggests the following statements to serve as maxims in the treatment and climatology of tuberculosis:
- The most important part of the treatment of tuberculosis in any form is rest—rest of body and mind. In pulmonary tuberculosis local rest of the lung may be added to general rest by restricted or superficial respiration, but always in as pure air as is obtainable.
- 2. When the sanatorium regimen can be carried out, whether in an institution or at home, climatic conditions are of secondary importance.

3. A change of climate, though not necessarily a

marked one, is nearly always good.

- 4. The native locality of the tuberculosis must be taken into consideration when a climatic change is made. The patient who spent his early youth in Norway or some other part of northern Europe, or one born in Massachusetts, Maine or northern New York, where the winter is rigorous, will usually do better in such climates as Colorado, Montana or the Adirondacks. Those from warmer climates will do better in climates such as those of New Mexico, southern California, Arizona and Western Texas.
  - 5. The ideal climate for the average patient with pulmonary tuberculosis is the one in which the extremes of temperature are not great; with only rare fogs or none at all; with the purest possible atmoshere; with relatively little humidity; with much sun-

shine, and with all conditions that permit the patient to live comfortably out of doors the greatest number of days out of the year and the greatest number of hours out of the twenty-four.

It is most important to know the pathologic type of tuberculosis. A childhood type of this disease with a residual pulmonary hilar gland involvement is an indication for heliotherapy. In the adult type of tuberculosis, occurring in childhood, heliotherapy - either artificial or natural-should be used with great caution. In the active tuberculous process of the exudative type, particularly, great harm can be and is frequently done. In such cases an increase in the exudate is frequently found, following this form of therapy. In cases of fibroid tuberculosis with little or no exudate, heliotherapy has been used with some success, but here, too, only with great caution. If the indication for such treatment is present, one may alternate the giving of natural heliotherapy (sunshine) with ultraviolet radiation from artificial sources, not giving the two the same day but reserving the artificial light for cloudy days. One also should observe precaution concerning the dosage when alternating between these two types of therapy, giving smaller dosage at each alternate period as tolerance established for one form of therapy does not hold for the other

# TREATMENT OF SYMPTOMS

Fever.—Nothing tends to diminish the temperature more than the rest, quiet and fresh air treatment already outlined. The patient who has high fever should not be given too much food at any time of day, even if the disease is tuberculosis; and most of what he does receive should be given during an afebrile period, if possible. If he is suffering from acute tuberculosis, the nutrition should be much the same as for any other serious fever.

Sponging with hot water will often give these patients comfort and, if they have profuse sweats, it keeps the skin clean. The frequency of such sponging depends on the height of temperature and its continuance. Antipyreties are rarely indicated. The following points should be observed in the treatment of fever: First and foremost, absolute rest in bed. preferably out of doors; artificial pneumothorax in selected cases; the cautious use, if at all, of tuberculin, and then only after other measures have failed; hydrotherapeutic measures suited to the condition and comfort of the patient; ample diet, but no "forced feeding", and the judicious use of medicinal antiovertics.

Cough.-Before the cough of a tuberculous patient is treated, the nose, nasopharynx, tonsils and lingual tonsils should be studied. Many times these parts will he found diseased and should be attended to, and much of the cough will disappear. The treatment of the cough depends on whether it is dry or moist, and whether expectoration is easy or difficult. If the cough is dry and hacking, much of it may be prevented by the will power of the patient. It should not be forgotten that many dry, irritating coughs are due to a lingual tonsil or throat irritation. Soothing, alkaline gargles, nonirritating inhalations of simple steam or steam medicated with some nonirritant drug, as a small amount of pine oil, will give relief. Many coughs of this kind are relieved by swabbing the lingual tonsil with boroglycerin. Often a cold wet pack to the throat at night is of benefit. These dry, irritating coughs should be relieved without giving medicine internally.

If there is considerable bronchitis with insufficient expectoration, or if the cough is frequent without expectoration, the following cough mixture is soothing:

	Gm. or Cc.	
Ŗ	Codeinae sulphatis 20 Ammonii chloridi 5	gr. iv
		r flši

M. Sig.: A teaspoonful, in plenty of water, every two, three or four hours, as needed.

Codeine is the best sedative preparation of the opium series to meet the indication. The action of all other expectorants is inferior to that of ammonium chloride, and ammonium chloride as prescribed above is not disagreeable. The does may be taken in Vichy or other sparkling water, if desired. None of the multiple sweet, sicksih, syrupy preparations offered by proprietary firms should be used in the bronchitis and catarrh of tuberculosis, or in any other kind of bron-

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chitis. It is not necessary to cause nausea or vomiting because a patient has a cough. The success of some of these syrups or malt preparations in dry cough is due to the fact that they soothe the throat and lingual tonsil. Such irritation can be allayed without the patient swallowing a mixture.

If the cough is loose, and if the expectoration is protuge, the stimulating effect of ammonium chloride and the sedative effect of codeine are not needed, and terpin hydrate is a good drug to use. To meet this indication of profuse bronchorrhea, it will not ordinarily be necessary to combine it with codeine. It should never be given in solutions, as not enough of it to be of advantage can be dissolved in any solution. It may be given in tablet, powder or capsule, and the usual dose is 30 cg. (5 grains), given with plenty of water four

or five times in twenty-four hours.

If there are cavities in the lungs, the patient should occasionally, by lying over the edge of the bed, allow gravity to aid him in expectorating the fluid and pus. Elevation of the foot of the bed is often of advantage. Sometimes inhalants containing creosote, oil of pine and benzoin are valuable. When there are large cavities which continue to fill up and cause septic fever, with the debility and loss of appetite that go with it, or when there is danger of serious hemorrhage, it may be wise to inject air or nitrogen into the pleural cavity and compress the diseased lung, ment should be given only in hospitals or sanatoriums, by an expert, as very unpleasant symptoms may occur; the heart may be subjected to unpleasant pressure and the outcome serious. On the other hand, the treatment is sometimes very satisfactory.

Pain.—Pain in the chest is most frequently due to localized pleurisies, but it may be a neuralgia or referred pain caused by disturbances of the more deeply seated nerves. Nothing is of more advantage in easing such discomfort than temporary strapping of the part of the chest affected. This is especially true of pain in the lower part of the thorax. Sometimes dry heat will ease it; rarely a sedative may be indicated, but generally it is not needed. Mild counter/irritation by a limiment or ointment is sometimes advisable over these regions of pain; blisters are rarely expedient, though

the thermocautery may be used. Dry cupping may give relief, and mild diathermy is often most satisfactory.

Hemoptysis .- Blood-tinged sputum or very slight pulmonary hemorrhages as evidenced by small clots or streaks of blood require no special treatment. Expectoration of pure blood, or coughing up a little blood repeatedly requires attention. Such a patient should rest, and should not undergo any exertion. The diet should be light, and hot foods or hot drinks should not be taken for a day or two, until the hemorrhage ceases. For this kind of bleeding, little other treatment is necessary. If the bleeding is more severe, the patient should immediately be placed in a semirecumbent position, with loosened clothing and should be assured that there is no danger, as there rarely is danger from hemorrhage during all the early stages of pulmonary tuberculosis. In the late stages, with cavities, a large blood vessel may rupture and the hemorrhage be fatal. It is well to have the patient lie on the side which is bleeding. This tends to prevent the blood from flowing into the bronchi of the other lung.

Besides reassuring the patient, it is often well, if there is a troublesome, irritating cough, to administer a hypodermic of morphine in just sufficient dose to quiet the irritability of the bronchial tubes and larynx so that the cough will be sufficient only for expectoration. (It is unnecessary to give a large dose which later will cause prostration; hence from  $\frac{1}{12}$ 00 for  $\frac{1}{12}$ 00 for  $\frac{1}{12}$ 00 for  $\frac{1}{12}$ 10 for  $\frac{1}{12}$ 11 for  $\frac{1}{12}$ 11 for  $\frac{1}{12}$ 12 for  $\frac{1}{12}$ 12 for  $\frac{1}{12}$ 12 for  $\frac{1}{12}$ 13 for  $\frac{1}{12}$ 14 for  $\frac{1}{12}$ 15 for  $\frac{1}{12}$ 16 for  $\frac{1}{12}$ 17 for  $\frac{1}{12}$ 17 for  $\frac{1}{12}$ 18 for  $\frac{1}{12}$ 18 for  $\frac{1}{12}$ 19 for  $\frac{1}{12}$ 19 for  $\frac{1}{12}$ 19 for  $\frac{1}{12}$ 19 for  $\frac{1}{12}$ 21 for  $\frac{1}{12}$ 3 f

0.006 to 0.008 Gm., will be sufficient.)

The more rest the bleeding part has, the quicker will the blood congulate in the bleeding vessels, but as has been stated, mere capillary oozing should not be taken seriously. With a real hemorrhage from the lungs, the rest must be absolute; the patient should not even speak, at least not above a whisper. For some hours he should not receive any food or drink. It is exceedingly doubtful whether an ice bag over the region of the bleeding is at all efficacious. The long used remedy of eating salt may reflexly, by irritation, increase the vasomotor tension and thus may occasionally stop a hemorrhage. Most of the remedies used and said to be satisfactory in hemorrhage from the lungs are drugs that increase the blood pressure more or less, which is undesirable. As the blood pressure more or less, which is undesirable.

generally cease, usually without medication, so that whatever has been given is then supposed to be the cause of such cessation. If the patient becomes faint, blood pressure is lowered, coagulation in the open vessel or vessels takes place, and the unpleasant symptom is cured by Nature's methods: therefore we should aid the natural cure of the condition by giving the patient glyceryl trinitrate to lower the blood pressure. Amyl nitrite is frequently advised, but its action is so sudden, and for a few minutes so intensely disagreeable, that it is hardly advisable to use this powerful drug, Glyceryl trinitrate on the tongue or hypodermically will act as efficiently and almost as rapidly without causing the faintness and throbbing head that amyl nitrite will cause. It is a mistake to give ergot, caffeine, suprarenal preparations, or digitalis, as these tend to increase the heart activity and raise the blood pressure.

If there is a tendency to repeated, more or less serious hemorrhages, the daily administration of calcium in some form, either as lime-water or calcium lactate, and the feedling of gelatin are indicated. Also, if there seems to be a general tendency to the oozing of blood and to hemorrhage, injections of aseptic horse serum is advisable; one or two subcutaneous injections will generally be sufficient. Inhalations of steam impregnated with some astringent such as tannic acid may be of value, if there is oozing of blood from the larger bronchial tubes, but such inhalations are of no value in bleeding from deeper portions of the lungs. as the astringent could not reach the reroin of

trouble.

The patient should generally remain in bed for a week after a severe hemorrhage. If the heart is impaired and some dilatation exists and if the expectorated blood is venous, and there are other signs of passive congestion of the lungs and of cardiac weakness, digitalis may be the best treatment for the condition; but for ordinary hemorrhages in pulmonary tuberculosis it is better, as stated, to administer glyceryl trinitrate in sufficient amount distinctly to lower the blood pressure temporarily.

It has been repeatedly noted that constipation increases the tendency to hemorrhage in pulmonary tuberculosis, and that the higher blood pressure caused by constipation is readily lowered by the administration of even simple laxatives. Consequently, in pulmonary tuberculosis the patient should not be allowed

to become constinated.

If the hemoptysis occurs late in the disease and is dangerous in amount, the patient may quickly succumb, whatever the treatment adopted. A most efficient treatment of this serious condition is to place elastic bandages high up on the legs, or even on all the extremities, to shut off the blood from the general circulation. It would be inadvisable, even if the hemorrhage were severe, to perform transfusion imme-diately, as anything that raises the blood pressure will be likely to cause a return of the hemorrhage from the open vessel. Later, after the hemorrhage has ceased and sufficient time for thorough coagulation has passed, the bandages on the extremities, one at a time, may be released and the blood allowed to return to the general circulation. The expansion of a lung may be restrained by tight adhesive straps and the necessity for pneumothorax he averted

Continued bleeding from the lungs (especially when cavities exist and a serious hemorrhage has taken place, or seems likely to occur) is one of the most important indications for the use of lung compression. Other indications, as previously suggested, are the presence of pus in a cavity in the lungs, and bronchicetais. It is also wise, perhaps, to compress a lung when, in spite of some weeks of proper treatment, the disease continues to spread in it, the other lung being

normal.

The gases that may be injected into the pleural cavity are nitrogen, oxygen and nitrogen, oxygen and air, or air and nitrogen. If only temporary compression is desirable, air, or a gas rich in oxygen sems indicated, as its absorption is more rapid. If a prolonged compression is desired, nitrogen should be used, as it is less readily absorbed, and therefore the compression is longer continued. A mixture of air and nitrogen is perhaps a good combination when a brief compression is desired; the air, being more rapidly absorbed than nitrogen, will allow a decision as to the ability of the patient to stand this compression before the longer compression by upre nitrogen is used. It has

also been urged that compression by air is safer than that by nitrogen from the fact that if gas bubbles enter the circulation, the air bubble is more quickly absorbed than the nitrogen bubble. Good technic with proper instruments, however, should preclude such an accident.

If compression is once done and its continuance is desired, more gas should be injected before all of that previously injected is absorbed. After an injection has once been made, and the pleural surfaces have come together, they become more or less adherent and it is difficult to inject the gas again into this pleural cavity.

The status of artificial pneumothorax has been well stated by Pottenger. Compression is not a cure for tuberculosis. Any patient is better off if he can secure healing without it rather than with it; but in a small number of cases a cavity, particularly a recent one, may be compressed which would otherwise continue to secrete; and in acute softening, toxemia which otherwise might prove fatal may be cut short. "It requires," he says, "considerable judgment to know when to compress and when not to do so. When once the technic is learned, one is often impelled to compress when a result more favorable could have been obtained without it."

Night Sweats. - This debilitating symptom is very characteristic of tuberculosis, and may occur even without much afternoon or evening fever; generally, however, it follows such increase of temperature, Therefore, the rest and fresh air treatment that prevent a rise in temperature will also ameliorate of prevent the night sweats. If, however, typical cold night sweats occur, nothing in the way of medication more successfully prevents them than atropine, from one-two hundredth to one-one hundredth grain (0.3 to 0.6 mg.), given, dry on the tongue, at bedtime. The hydrotherapeutic measures already advised, that is, the warm water, and later cold water morning spongings, are of value as preventives. If the patient is at rest and is not getting any exercise, good massage followed by an alcohol rub is an excellent method of stimulating a more healthy circulation in the skin and muscles. and of diminishing the tendency to profuse perspiration. The avoidance of constipation and the maintenance of

a healthy circulation and good activity of the kidneys all prevent night sweats and the accumulation of toxins in the blood. If there is much circulatory weakness. several doses of strychnine sulphate a day, or digitalis, may also prevent night sweats.

Diarrhea. - Simple diarrhea occurring in patients with tuberculosis generally means either that the patient gets chilled or that the diet is incorrect. tion of these conditions will soon stop such diarrhea. Tuberculous diarrhea, i. e., a diarrhea due to tuberculous disease of the intestine, is a serious complication not only of pulmonary tuberculosis, but also of any other form. It often occurs in the last stage of the disease. Rest in bed and a carefully selected diet is the treatment. Whether the diet consists of milk alone, or of a little meat and eggs with milk, should depend on the patient. Generally, vegetables and fruit should be temporarily withheld, and the cereal foods

diminished in amount.

Bismuth subcarbonate may stop the diarrhea, but bismuth should not be long continued. Lime water may be of benefit. If the kidneys are normal and there is no albuminuria, phenyl salicylate (salol) is good treatment. At times, one of the creosote combinations is valuable. The administration of opium in some form may be necessary before diarrhea can be checked, and in the last stages of tuberculosis diarrhea may not be prevented. Colon washing with warm physiologic sodium chloride solutions is sometimes markedly sedative and of value. The bowels should always be kept especially warm, and the patient with diarrhea should not be subjected to intense cold. Diathermy to the abdomen, mildly applied and for not too long a period, is beneficial. Daily treatments may be given.

Dyspnea .- If the patient is in the last stages of pulmonary tuberculosis and must soon die, there is no excuse for not preventing the air-hunger, and morphine administered in properly selected, small doses will often relieve the dyspnea.

The Pneumonic Type of Pulmonary Tuberculosis .-Such a condition is likely to occur as a part of acute miliary tuberculosis, but it may develop in a lung as an acute exacerbation of a chronic tuberculosis. The

disturbance may be ushered in with a chill, high, irregular temperature, frequent, short cough, considerable dyspnea, at first without physical signs of gross consolidation, but later showing in a part of a lobe, or perhaps the whole lobe, the usual pneumonic signs, even with rusty sputum. The rusty expectoration soon disappears, however, and yellowish, greenish sputum, probably blood streaked and loaded with tubercle bacilli, occurs. The prognosis is very serious, but the acute exacerbation may cease. The treatment is not dissimilar from that of an ordinary oneumonia.

Laryngaal Tuberculasis.—The prognosis of this condition has, up to recent years, been considered very bad indeed, but with more skilful treatment by throat specialists, with the added rest cure and with tuberculin treatment, many such cases are aborted and the lives of the patients saved. The instances of tuberculosis of the larynx are rare in which, preceding or subsequent to the beginning of the laryngaal disease, some portion of the lungs will not be found affected.

The exact local treatment of a tuberculous larynx depends, of course, on the location of the ulcer or ulcers. If they are so situated that swallowing is very painful, anesthetizing sedatives must be given. Various preparations of silver, lactic acid and menthol are used by different clinicians to aid in healing the ulcers, but the tuberculin treatment, properly administered, is probably generally advisable.

Tuherculous Peritonitis.-This condition uncomplicated with tuberculosis elsewhere must, of course, be differentiated from many abdominal conditions. If there is fluid, other causes of ascites, as inflammation of the liver, serious cardiac insufficiency and ovarian cysts must be excluded. Tuberculous peritonitis may appear in several forms: the miliary which causes ascites, the fibrocaseous, the fibro-adhesive and that which causes tumor masses. The range of temperature (although in chronic tuberculous peritonitis there may not be any increase of temperature, and it may even be subnormal), the localized tumor masses and fluid confined to one portion of the abdominal cavity by adhesions will aid in the diagnosis. In tuberculous peritonitis there may be more fluid on the left side of the abdomen than on the right, as the diseased mesentery retracts and draws the bowel to the right. As frequently tuberculosis is not present in other organs, the diagnosis is often difficult, and a tuberculin test is indicated. The fluid in the abdomen in tuberculous peritonitis does not contain pus, unless there is a mixed infection, as the tubercle bacillus does not produce pus. The drawn serum very frequently does not show tubercle bacilli, but a guinea-pig inoculated with the serum will, in due time, develop tuberculosis, if that is the infection from which the patient is suffering. If the exudate found on laparotomy or withdrawn for examination is bloody, it shows that the disease is active. Tuberculous peritonitis may originate from infected mesenteric glands. Much false membrane is formed, which causes many adhesions of the intestines.

which causes many adhesions of the intestines. A patient may apparently be very well and still suffer from tuberculous peritonitis, and the prognosis is rather favorable if such a patient is operated on. It is not advisable to operate for tuberculous peritonitis if tuberculous infiltration is already in the lungs. At times, withdrawal of fluid from the abdomen by aspiration, tonic treatment, rest and the exposure of the abdomen to the rays of the sun will be curative. Many sanatoriums have installed the necessary equipment for giving heliotherapy, or sun baths. The direct rays of the sun are thrown on the chest or abdomen. Tuberculous peritonitis has been treated by injecting oxygen into the peritoneal cavity without langarotomy.

If the ascites tends to recur, or remains, laparotomy should be done, and sunlight let into the abdomen. Laparotomy may cure tuberculous peritonitis when there are simply tuberculous masses or tumors, but no

fluid in the abdomen.

The results of operation may be summed up about as follows: There is slight danger from the operation itself. Temporary improvement may almost always be expected. Fatal cases usually terminate in a few months after the operation, while in about one third of all cases recovery takes place in from one to two years after the operation. Antiseptic injections or continuous drainage after operation are not indicated and are useless.

Tuberculosis of the Genito-Urinary Tract.—Tuberculosis of the bladder and prostate is rarely primary, and often has gonorrhea as an antecedent. Tuberculosis of the testis is by no means infrequent. Removal of the testis is, of course, advisable, and operative intervention in the bladder and prostate may be indicated. A tuberculous kidney should be removed as soon as it is diagnosed, provided the other kidney is normal. The general treatment is the same as in all forms of tuberculosis.

Tuberculosis of the Cervical Glands .- It should be urged that while surgical removal is necessary and very frequently indicated, every gland that is needlessly removed weakens by just so much the ability of the system to protect itself against all infections. Roentgen treatment, while lauded by some men. seems unsatisfactory to many clinicians. When infected or broken-down glands are being removed, the dis-section should be very carefully done, lest the surrounding parts be infected with liberated germs, or if not locally infected, lest the bacilli be absorbed into the lymph circulation and cause general infection.

A gland should not be removed merely because it is enlarged. It is a serious mistake however to allow enlarged glands to cause such inflammation of the surrounding tissues as to render it necessary to remove parts of muscles, to say nothing of the danger of such chronic inflammation necessitating, during operation, injury to important blood vessels and nerves. Glands should be removed before they cause injury to the patient or the surrounding tissues. Infected tonsils and infected teeth should be removed before the lymphatic glands or other parts of the body become infected, and before a swollen gland of the neck is operated on, as the gland may subside.

The tuberculin treatment of tuberculosis of the glands, especially in children, is much in vogue, and if the tuberculin is used in carefully graded doses the results seem to be satisfactory. Caseated glands should be eradicated or curetted, however, as the tuberculin treatment will not cause resorption. Also, the exact value of this treatment for tuberculous glands cannot be determined, as fresh air, good food, iron tonics, and medical supervision are active aids in the cure of this condition. Too large doses of tuberculin may overstimulate the diseased glands and cause general infection. Also, one does not know how many concealed diseased bronchial glands will be stimulated by the tuberculin injections; hence a very careful study of focal reaction should be made throughout the treatment. Bier's hyperemic therapy is probably inexcusable. Sun baths and seashore air are the best treatment for these children.

Bone and Joint Tuberculosis -In tuberculosis of these parts of the body, according to Fiske, there may be a slight leukocytosis of approximately 12,000, while in osteomyelitis, the leukocytosis is generally not far from 16.000. Children who have bone tuberculosis frequently do well at sanatoriums or in hospitals especially arranged for their outdoor or veranda treatment. They do especially well at the seashore, and direct sunshine is a valuable addition to the treatment of this kind of tuberculosis. Tuberculosis of the glands and bone and joint tuberculosis react favorably to sun baths, both general and local, in combination with the invigorating effects of cold at moderately high altitudes. Such treatment can be given at home by the institution of simple arrangements at first in the patient's room, later on a veranda and finally, when the surgical condition will permit, by free movement in the open air.

Tuberculous Meningitis—Meyers (Am. J. Dis. Child, May 1915, p. 427) classified the ethologic factors, symptoms and signs of 105 patients with nuberculous meningitis. Meyers found that 38 per cent of these children had not had previous diseases; in the remaining 62 per cent measles had occurred more frequently than any other disease. The average duration of the infection from the time of the beginning of symptoms was seventeen days. Meyers thinks that the disease is not so rapidly fatal as it once was on account of lumbar puncture being now more frequently done, thus preventing early deaths from cerebral pressure.

Lumbar punctures were made from once to seven times on a single patient. He finds that lumbar puncture prevents convulsions, which become rare in the clinical history of the disease thus treated. Meyers believes that the advantage of lumbar puncture lies not only in relieving pressure, but also in eliminating a certain amount of toxin. He has not found that umpleasant symptoms occur from the withdrawal of even a considerable amount of spinal fluid, even though

it was not under high pressure.

Meyers' routine is to allow the spinal fluid to drain until it runs at the rate of from 10 to 12 drops per minute, and to draw off from 20 to 30 cc. of fluid, depending on the pressure. Eighty per cent of the cases showed increased pressure, varying, of course, in degree. If the child lived, lumbar puncture was done once every forty-eight hours. If the fluid removed at the first puncture did not show the organism causing the meningitis, the later punctures usually did, and tubercle bacilli were found in 21.5 per cent of these 105 cases of tuberculous meningits.

When there was no increase of pressure in the cerebrospinal canal, there were almost no disturbances of the reflexes, and there did not seem to be any relation between the amount of pressure and the presence of convulsions, bulging fontanel or retraction of the head, The fluid of this disease was never found to be really turbid, and was generally absolutely clear. The cell count of the fluid varied from 24 to 960 per cubic millimeter, with an average of 198. This cerebrospinal fluid cell count seems to vary with the leukocyte count of the blood: The greater the leukocyte count, the greater the number of cells in the spinal fluid. The prevailing type of cell in the spinal fluid was the small mononuclear. ranging from 90 to 100 per cent in 67 per cent of the cases, and from 80 to 90 per cent in 20 per cent of the cases. A fibrin clot was found in 70 per cent of the patients, and a positive globulin test in about 50 per cent. The globulin content seems to vary directly with the cell count. The first part of the spinal fluid withdrawn at each puncture has a different cellular content from the last part that is withdrawn, the first part giving the greatest number of cells.

One fourth of the cases showed a leukocyte count of the blood between 10,000 and 15,000; the lowest count was 8,500, and the highest 48,000. Absence of eosinophils, as in some other diseases, is considered an

unfavorable symptom.

In those tested for the Pirquet reaction, 63 per cent

In twenty-five per cent of the cases there was a history of definite exposure to tuberculosis. Thirty per

cent of the patients showed lung involvement, and had more or less cough. In 71 per cent the eye reflexes were almormal, but in 29 per cent the pupils were equal, and reacted normally to light. Thirty per cent showed normal patellar reflexes, and in 21 per cent the reflexes were absent. There was a positive Babinski reflex in 21 per cent. Fifty per cent of the cases gave the Oppenheim sign. Ankle clonus was rarely present. Kernig's sign was present in 27 per cent of the cases. Forty-three per cent showed some signs of paralysis, with strabismus as the most frequent form. Seventy per cent showed some rigidity of the neck, and, late in the disease, there was definite stiffening of the limbs.

While 39 per cent of the patients had had convulsions before entering the hospital, as stated, spinal puncture seemed to relieve or prevent convulsions. The subjective symptoms were drowsiness, indifference, and sometimes irritability. Eighty-five per cent had vomiting as an initial symptom. This vomiting had no relation to the food taken, and in no instance was there projectile vomiting as is so frequently seen in meningococic meningitis. Pain was a frequent

symptom.

In 18 per cent of the cases the urine showed acetone,

and sometimes slight traces of albumin.

Before death, the pulse, temperature and respiration in about half of the cases became higher. Early in the disease the pulse was slow and irregular; later in the disease it became soft and rapid. In 64 per cent of the cases there was a remission, with a drop of pulse and temperature; but this was apparently not a sign of improvement. Also, a patient who has been comatose may brighten up and answer questions from twenty-four to thirty-six hours before death. Forty-two per cent of the patients showed terminal bronchial pneumonia. In no case in this series was there recovery.

Enough cases are now on record to show that recovery from tuberculous meningitis is possible, so that the prognosis is not absolutely hopeless, although very dire. If the child is suffering pain, codeine or some form of opium should be administered in doses found sufficient for the individual, but not large enough or so frequently repeated as to produce coma; that is, if coma occurs it should be known that it is caused by

DIFT

the disease and not by the drug. The little patient, however, should not be compelled to suffer severe pain. Even if food is refused, the child will generally drink milk.

Acute Miliary Tuberculosis .- This occurs in several forms; one in which all the organs of the body are attacked, others in which only certain organs are diseased. In another form the tubercles may be larger and show degeneration. The disease is always serious. generally fatal, and clinically occurs in the meningeal form just described or as a general acute bronchooneumonia of both lungs, or as the typhoid type. In the lung form the sputum is loaded with tubercle bacilli and the diagnosis is readily made. In the typhoid form there may not be any cough, or any real lung signs. although lesions may be found in the lungs on necropsy. It may be difficult at first to distinguish this form from typhoid, but the temperature is likely to be very high in the evening with a considerable drop in the morning, and there are profuse sweatings. Such morning remissions occur early in the disease, thus differing from typhoid. The pain and tenderness in the abdomen, and the joint and cerebral symptoms, will soon make the diagnosis positive. Diarrhea usually does not occur with acute miliary tuberculosis; in fact, the patient is generally constipated-another symptom different from those in typhoid.

The treatment is similar to that of any acute infection with the exception that great care should be exer-

cised to sterilize every excretion of the body.

Tuberculous Arthritic.—Pain and swelling of the joints occur as a result either of the circulation of tuberculous toxins in the blood or of the presence of tubercle bacilli in the affected joints. It is probable that a considerable number of cases of so-called rheumatism are due to tuberculosis. An almost positive sign of tuberculous arthritis is the occurrence of focal reactions (pain and swelling) in the affected joints after injection of old tuberculin subcutaneously.

# DIET IN TUBERCULOSIS

Much attention has been given during the past few years to the so-called Gerson and Hermannsdorfer diets used in tuberculosis. At one time raw meat and meat juices were strongly advised for this disease, but at present the evidence in favor of such a diet does not indicate that it has any special value. There is some indication that a high protein diet increases the coagulability of the blood. Hermannsdorfer was convinced that a diet largely acid in character hastened the healing of wounds.

Dr. Edgar Mayer has surveyed the evidence for the diets in which salt is restricted in cases of tuberculosis. He has also given special attention to the other factors involved in diets for the tuberculous. He is inclined to believe that a high protein ration is of value. Apparently the fat in the body can be held in reserve and be drawn on at will. Several authorities have recommended excess fats in the diets of the tuberculous.

It has not been established that the calcium in the blood in tuberculosis is lower than ordinarily; excess calcium in the food does not seem to aid the calcifica-

tion of the tubercle.

Neither has it been certainly demonstrated that any large increase over the usual amount of vitamins is advisable, even for persons in good health. If it can be shown that a definite lack of vitamins exists, that lack should be supplied. But only rarely in the American population does any adult seem to suffer from a real vitamin deficiency. The experiments with vitamin feeding may be carried out over long periods of time, since it does not seem that harm can result from a relative excess of vitamins.

The two diets most talked about at the present time are the Gerson and the Hermannsdorfer-Sauerbruch diets. These do not vary greatly one from the other. Both diets eliminate sodium chloride or common salt, substituting a calcium-rich salt; both restrict meats and water greatly; both are rich in fat and protein but low in carbohydrates; both provide for giving much raw food with cod liver oil, phosphorus and calcium.

In surveying all the available evidence for these diets, Mayer concludes that some people react favorably to the withdrawal of table salt and that some improve on a larger than normal vitamin intake, but that it is not safe as a routine proposition to put all patients with tuberculosis on a special diet of such character with the idea that it will be beneficial to all of them. The person

with tuberculosis is a human being and no two human beings are exactly alike. Every patient must be studied as an individual and treated on an individual basis.

#### PROGNOSIS

In the first place, as to the probability of cure of tuberculosis, it should be remembered that statistics of necropsies show that from 30 to 35 per cent or more of patients who have died from causes other than tuberculosis show evidence of that disease, either healed or latent. In general, the prognosis of pulmonary tuberculosis is modified by the family history, by the causes which have allowed the disease to develop, by the whole general condition of the patient, and by the amount of lung tissue involved. A tuberculous process that begins in the lower part of the lung, following a pneumonia, gives a bad prognosis. A generally debilitated and anemic condition will necessarily retard or preclude a cure. An associated laryngeal or intestinal complication makes the prognosis very serious.

When a patient is first seen, the prognosis should be guarded, as it is only after weeks or months that the decision can be made as to how much this patient may improve. A person who looks otherwise well, except for the fact that tuberculosis is discovered, may develop an acute form of the disease. The physician should individualize the patient, not only as to his surroundings and his occupation, but also as to his attitude. His disposition should be studied. It is a mistake to send to a sanatorium a patient who will be restless under sanatorium restrictions, or who will be so seriously homesick as to lose his appetite, or who will not obey instructions. Therefore, the mental attitude, the individuality and the willinguess of the patient to cooperate viduality and the willinguess of the patient to cooperate

are of great importance in the prognosis.

The opinions of pediatricians differ as to the prog-

nois of tuberculosis in infants. While most declare that when diagnosed clinically it is absolutely fatal, others affirm that they have seen infants survive tuberculous disease. The younger the child, the less capable is he of defending himself and the greater is the tendency of the tuberculosis to become generalized. Infection from the mother is more dangerous than from

other members of the family, because the child is more

likely to become reinfected.

The location of the disease is most important in prognosis. If the tuberculosis is still localized in the glands, a less serious prognosis can be given. If signs of generalized tuberculosis are present, the case must be regarded as desperate. Chronic surgical tuberculosis is the only form which offers a good prognosis.

It is a question whether asthma, which was long supposed to protect against tuberculosis, really does so. Certainly an asthmatic patient may have tuberculosis. It seems to be a fact that persons who suffer from heart disease, especially if there is a sufficient loss of compensation to cause more or less dyspnea and pulmonary passive congestion, do not have tuberculosis so readily. This subaeration may interfere with the growth of tubercle bacilli.

Tuberculosis of the cervical lymph nodes may be due to an autoinfection. In other words, bacilli may be contained in the patient's own sputum, infect the tonsils and be carried from there to the cervical glands.

A more or less continuously rapid pulse gives a bad prognosis. A temperature that is not greatly lowered by rest gives a bad prognosis. The case is serious as long as there is a morning fever. A patient whose temperature is normal or subnormal in the morning, even if there is considerable rise in the afternoon and evening, may not only improve, but may recover. Any sexual-excess, and even any sexual act during tuberculosis will aggravate the condition. A slight gain in weight, while desired and looked for, and generally indicative of improvement, is not necessarily a positive indication that the prognosis is absolutely good. Many instances occur in which the patient gains weight for a time, under proper treatment, but the disease progresses. Therefore, a slight but steady gain in weight should be considered satisfactory, but should not cause too favorable an opinion of the outcome to be given.

It is considered a good prognostic sign when the lymphocytes in the blood are increased in number, showing that the nutrition is improving. It has also been noted that a normal number of eosinophils indicates a good prognosis, while an absence of eosinophils gives a bad prognosis. Whatever the condition. however, it should constantly be borne in mind that pulmonary tuberculosis is curable in the first and second stages and a cure may even take place in the third stage, or when there are cavities,

Pregnancy in a tuberculous patient makes the prognosis bad, and should call for a consultation to decide as to whether or not abortion should be produced.

### APPENTED TUBERCULOSIS

A patient who has even a temporary return to health must generally go to work, and the question of vital importance is, What shall the work be? There is no light outdoor work suitable for such recovered patients; hence, unless the occupation is one that is a menace to his health, a patient should return to his previous work. The education received during his recovery should have taught him how to live to keep his health. The next important rule for him to follow is to return to his physician for observation and advice at frequent intervals.

There has been a marked decline in tuberculosis in the United States during the last fifty years. W. P. Shepard (J. A. M. A., March 8, 1930, p. 697) says the factors involved in this decline are numerous and may be conveniently grouped under three heads; tuberculization, physical well being, and the availability of good medical and public health facilities. Each of these factors operates independently of the others in a given population, and each may become dominant temporarily only to be replaced later by another.

# TUBERCULOSIS AND PREGNANCY

Most women with arrested pulmonary tuberculosis may safely bear children, but they should be under the care of an internist throughout each gestation. It is important for the patient to observe the general rules of hygiene rather rigidly. She should have a well balanced diet with a relatively large amount of milk and vegetables, should have sufficient sleep and a period of rest during the day, and should be out in the sunshine as much as possible. Viosterol, especially during the winter months when there is little sunshine, is of benefit. Symptoms that are especially to be looked for are fever, persistent cough, night sweats, loss of weight instead

of gain, dyspnea and hemoptysis. If the pulmonary condition has been in abeyance for three years, the patient will most likely continue with her pregnancy in a normal way without harm. The spontaneous onset of labor may be awaited, and during the first stage a policy of watchful expectancy should be followed just as with other patients. Sedatives should be given to secure as much rest as nossible.

Unless the second stage promises to be short, it should be curtailed as much as possible by a low forcesp operation, provided the fetal head has reached the perineum. Otherwise it is best to leave the patient alone. Inhalation anesthesia should be avoided whenever possible. Local infiltration anesthesis should be employed instead. If a general anesthetic is necessary, ethylene is probably the safest. The patient must be closely watched during the puerperium because occasionally there is a recurrence of pulmonary tuberculosis.

at this time

The death rate for babies born of mothers with outspoken tuberculosis is not much greater than it is for children of healthy mothers. However, if all the miscarriages and deaths in infancy are counted, there is a mortality of about 60 per cent before the end of the first year. Hence there is a constitutional inferiority in a large proportion of babies born of mothers with active pulmonary tuberculosis. The question of whether tuberculosis is transmitted from the mother to the child in utero is still unsettled. Some authorities maintain that this practically never occurs, while others insist that it is not infrequent. There is no doubt that tuberculosis may be found in some placentas and in a few new-born fetuses. However, in most instances in which infants show evidence of tuberculosis they acquired it after birth. They are born with a low resistance and, unless they are brought up under exceptionally good hygienic surroundings, they may contract the disease. In the case cited, if no symptoms or signs of tuberculosis can be detected after delivery, the child may safely be placed at the breast. If unfavorable symptoms make their appearance, it is best to separate the child from the mother, for a short time at least, unless there are ample facilities for isolation in the patient's home.

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# DISEASES OF THE RESPIRATORY TRACT

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## COMMON COLDS

Colds far surpass in frequency any other disease condition. Probably there is no immunity acquired after an attack of corvza, pharvneitis or bronchitis: in fact, ordinarily, the person is at least temporarily more susceptible to taking or developing a fresh cold. This may not be quite true of influenza or grip, because many persons have a real or pseudogrip attack early in the fall or winter and are then more or less immune from acute attacks during the rest of that season. The immediate debility that an acute cold causes, with the possibility of opening the way for the entrance of more serious disease, should cause every cold to be considered seriously and treated energetically. Of 582 children studied from Sept. 1, 1928, to June 1, 1929, C. C. McLean (J. A. M. A., Nov. 1, 1930, p. 1339) found that 241, or 41.7 per cent, had one or more recurrent infections. Weather conditions had little or no effect on the number of primary or recurrent infections, and the recurrent infections were apparently as frequent in those in whom the tonsils and adenoids had been removed as in those who had not had this operation. Contact with individuals who had the disease seemed to influence the number of primary infections.

Acute colds are probably invariably due to infection. A too dry atmosphere, as is found in so many houses today, may so irritate or congest the nostrils as to allow the least irritant to cause at first a simple inflammation of the mucous membrane, which congested area may later pick up and harbor, or cease to kill, germs. Outdoor life does not predispose to colds as much as indoor life, and persons whose occupation is indoors are more likely to have colds than those whose occupation is out-

# SQUODEN GLOVE L. WELSH

doors, Chilling, whether indoors or outdoors, certainly predisposes to colds in some persons. Chilling of the surface of the body congests the inner organs and probably the mucous membranes of the air passages. If the mucous membrane of the nose is congested, it more

readily becomes infected.

Acute pasal inflammation, often called a "cold in the head," is of frequent occurrence in some regions, especially near the seacoast, and occurs repeatedly in certain persons who seem to have a susceptibility to inflammation in the nose. Some persons cannot be exposed to draft on any part of the body without developing an acute coryza. It is thought, however, that while most acute nasal inflammations are due to infectious germs, more or less chronically hypertrophied mucous membrane and sluggish circulation in this membrane may allow simple noninfectious inflammations to develop when irritation of any kind occurs. Other persons who do not have this susceptibility may become chilled, may be subjected to violent cold or damp winds, and may even get wet and still never develop a nasal inflammation. Just as large tonsils more readily catch germs and become diseased, or more readily harbor germs and have recurrent inflammations, so hypertrophied mucous membrane of the nostrils becomes susceptible to reinfection or to reirritation. Frequent acute colds, more or less constant subacute inflammations, or chronic inflammation may result from such a condition.

#### PROPHYTAYIS

The preventive measures consist of proper bathing to keep the skin in good condition; proper clothing, depending on the region, weather and exposure: proper heating and ventilation of living rooms, bedrooms and buildings in which persons are employed, and, in the case of the child, proper heating and ventilation of the schoolrooms. Too severe exposure of young children and babies to dampness and winds is inexcusable as it does not increase their resistance against catching cold, and often precipitates more serious conditions. Any person who has a tendency to nasal or pharyngeal colds should not suffer undue exposure at night. Too many open windows may cause too much direct

draft over the face. Outdoor sleeping should be governed by common sense. Cold daily sponging of the child's face, neck and chest, followed by quick friction. is a splendid means of decreasing the likelihood of catching cold or becoming chilled. Older persons may take cold showers or cold plunges in the morning, if it is advisable in individual cases

Children especially should not be subjected to unnecessary infection by being taken into crowded cars or stores or into assemblages where it is impracticable to avoid close contact with coughing or sneezing persons who do not properly protect the surrounding atmosphere by using handkerchiefs.

A child or an adult who has repeated colds should po examined and properly treated medically or surgically by a nose and throat specialist. The family should also be taught that the exchange of handkerchiefs and the use of the same towels when one member of the family has a cold or sore throat is inexcusable. Indirect contagion by this method is probably frequent, but even more frequent is infection from a telephone contaminated by a carrier of an acute or chronic "cold," Another active source of infection by "cold" germs is the infected hands of those who have colds, to say nothing of kissing. During all colds, the nasal and throat secretions or excretions should be received into paper handkerchiefs, or pieces of cheesecloth, and either immediately burned or deposited in a paper bag to be destroyed later. If handkerchiefs are used, they should be washed separately and soon after using

A too dry indoor atmosphere can harm the mucous membranes of the upper air passages by drying them, and the first irritant that attacks them may cause an

inflammation.

A. R. Dochez et al. (J. A. M. A., Nov. 4, 1933, p. 1441) made a simple antigenic mixture consisting of heat killed cultures of pneumococci, B, influenzae and Streptococcus haemolyticus, organisms previously found to be important as secondary invaders. This vaccine was given at weekly intervals over a long period of time, nine injections in the autumn followed by a similar number in February and March. Infants belonging to the age group highly susceptible to respiratory infection, were chosen for immunization because in them the incidence of respiratory infection is very high. There was no reduction in the number of simple colds or respiratory infections associated with fever in the vaccinated as compared with unwaccinated groups. There was however an apparent reduction in the severity of infections in the vaccinated infants.

#### TREATMENT

Acute coryza having begun, an attempt should be made to abort it. There are various methods of relieving internal congestions, and the general principles are the same in all cases, wherever the localized inflammation may be. These general methods include some means of reducing an increased temperature; of bringing the blood to the surface of the body and increasing perspiration; of producing free catharsis and thus depleting the blood vessels and lowering the blood pressure to relieve indirectly the tension in the region of congestion, and of preventing the devolpment of the second stage, or stage of secretion, if possible. Methods used to meet one of these indications will many times meet one or more of the others; hence the treatment is often very simple.

If the patient is first seen in the morning, or before the middle of the afternoon, a good treatment is a saline purge of some description, as exemplified by the compound effervescing powder (Seidlitz), the effervescing magnesium citrate, potassium and sodium tartrate (Rochelle salt) or castor oil. If the patient is seen first in the evening, a less quickly acting cathartic is advisable. A single dose of the aromatic fluidextract of cascara sagrada, U. S. P., may be given at bedtime. The dose may vary from 5 cc. for a child of 3 to 5 years of age to from 5 to 15 cc. for an adult. The old fashioned powder of ipecac and opium is still given by many physicians and often is beneficial, but may cause considerable nausea. Also, opium or morphine in any form tends to inhibit free action of the bowels. which is undesirable. One of the best treatments is one of the coal tar products, such as acetylsalicylic acid. antipyrine, or acetphenetidinum. Any one of these may be given in one fair sized dose or in two medium sized doses, or in several small doses. One gram of antipyrine would be a full dose; 0.50 Gm., repeated in five or six hours, would be a medium dose.

It should be remembered that caffeine has been shown not to protect the heart from the depression caused by large doses of a coal tar product; therefore, there is no object in adding caffeine to such a prescription. When these coal tar products are ordered, it is well to give hot lemonade, coincidently. Perspiration is stimulated more readily by this means.

Provided the patient is not to be subjected to expo-

sure soon, a hot bath may be employed to relieve internal congestions, and can be prescribed coincidently with the other treatment. Acetylsalicylic acid (aspirin) is now more largely used than almost any other drug to abort colds. The laity, on account of the instructions which they have received concerning the dangers of acetanilid and similar drugs, now buy and use this drug with too great freedom.

Rhinitis tablets are sold everywhere to the laity, and are much used by physicians. These are various combinations of morphine, atropine, strychnine and quinine. The old aconite treatment of colds has mostly given place to the newer treatments already described. The whole rhinitis tablet combination probably represents principally the action of atropine with some help from the morphine, both of which will dry up the secretions of the nostrils and throat. The small amount of strychnine and the minute doses of quinine are not active. In other words, a small dose of atropine sulphate, ½nog grain (0.128 mg.) every three hours for ten doses, acts as well as one of these rhinitis combinations.

There is no question about the drying up of secretions by morphine, if this drug is pushed, but rarely is such treatment needed.

Quinine sulphate has been used for years as an abortive treatment of colds, and the lairy, until more recently adopting acetylsalicylic acid, have resorted to this drug. Small doses would probably not have any very decided action; large doses are inadvisable at this stage of the cold because of their tendency to cause congestion of the middle are.

Spraying or snuffing solutions into the nostrils at this stage are inadvisable. The throat may be cleansed by gargling with warm physiologic sodium chloride solution which is roughly represented by one-fourth teaspoonful of salt to half a glass of warm water. If the patient has been known to be exposed to some acute throat or nasal infection active antiseptic gargles and sprays may be used; but an acute coryza will rarely be aborted by local treatment.

If the inflammation is not checked and the second stage develops, that of profuse mucus and some muco-purulent discharge, cleansing of the nose and throat becomes urgent. At this stage all of the foregoing abortive measures should cease. A patient who has had his food limited to a small amount of fluid nour-ishment for from twenty-four to thirty-six hours, may now resume his normal diet. Sodium bicarbonate, in small doses, is of value at this stage to promote and linearly secretion and combat acidosis.

Purulent discharge from the nostrils should not be allowed to block up the passages. Consequently, spraying with warm saline and alkaline solutions should be more or less frequently employed. Various compound solutions or tablets for solution are offered but there probably is no advantage in these combinations over more simple ones. The simplest cleansing solution is one made from one-half teaspoonful of salt and one-half teaspoonful of sodium hicarbonate to a glass of warm water, or half these amounts for half a glass of water. To be properly soothing, the water should always be warmed. The same solution may be used as a gargle. There are many mild and pleasant combinations for gargling. If stronger antiseptic solutions are required or advisable, hydrogen peroxide is valuable, as 1 part of the official liquor hydrogenii dioxidi to 4 or 5 parts of warm water for a gargle, or 1 part to 7 or 8 parts of warm water for a nasal spray. Nasal spraying and proper cleansing of the nose protect the adjacent sinuses from infection: douching is dangerous.

Cleansing the nasopharynx by snuffing back a solution from a teaspoon or a small vial, or snuffing back a spray, or garging and then throwing the head forward and washing the nasopharynx, protects the custachian tubes from infection. Two cautions should be superseted; first, that douching of the nasal passages. should not be done with the nostril blocked, or with a high placed douche reservoir, as the pressure is likely to be sufficient to send fluid into the custachian tubes or into the sinuses, and cause inflammation of these parts. The second precaution is that it is not well to cleanse the mucous membrane of the nostrils too thoroughly of mucus before the patient goes into the outside air, especially if that air is dust-laden. The proper time to spray is when the patient is to remain in the house for a short time. If he is sprayed and then must go out of doors, he may receive a nonirritant oil spray to furnish coating for the mucous membrane. This should be used after the alkaline spray.

It may be advisable at this time to use a camphormenthol oil mixture either as drops or as a spray. The

following may be suggested:

B Menthol | 25 | 5 | 5 | Liq. petrolatum | 50 |

If the secretion from the nose is tenacious and hard to dislodge by blowing the nostrils, ammonium chloride may be a drug of value. It is a stimulant to the mucous membrane of the upper air passages as well as to that of the bronchi. It may be given in a simple preparation as:

If the coryza tends to become subacute and prolonged, a small dose of quinine and a small dose of iron, with or without strychnine, are advisable. The following capsule may be used; the doses may be modified for a child.

| B | Strychninae sulphatis | 0|04 | \( \bar{a}\) \( \bar{a}\) | gr. xv | 2|0 | M. et fac capsulas siccas 20.

Sig.: A capsule three times a day, after meals.

Spraying with suprarenal or ephedrine solutions is often of advantage, but sometimes is followed by more congestion. Frequently it is efficient in temporarily

relieving congestion and giving comfort.

A study was made by Harold S. Diehl (J. A. M. A. Dec. 23, 1933, p. 2042) which showed the relative values of various drugs and drug combinations in the treatment of 1,039 cases of acute coryza, 262 cases of subacute or chronic colds, 114 cases of influenza and 53 cases of acute pharyngitis. Of the drugs studied only opium and certain alkaloids derived from it. seemed to be of value in the treatment of acute coryza. Combinations of papaverine with codeine, papaverine with dilaudid, and papaverine with morphine were followed by definite improvement in from 74 to 78 per cent of the cases and in the doses used these combinations seemed to be relatively non-toxic. The dosage 1/4 grain of codeine with 1/4 grain of papaverine is recommended. The specific directions given with this codeine-papaverine combination to persons of various weights are as follows:

75 to 90 pounds-One capsule of 1/4 grain codeine and 1/4 grain papaverine after breakfast; two at bedtime.

100 to 129 pounds-One capsule after breakfast and three at bedtime.

130 to 169 pounds-One capsule after breakfast, one after lunch, three at bedtime.

170 pounds and over-One capsule after each meal, and depending on weight, three or four at bedtime.

The change most frequently observed by persons who reported improvement was a prompt decrease or complete disappearance of the pasal discharge and congestion.

This medication is not of benefit in subacute or

chronic colds, in pharyngitis or influenza, This discussion of the treatment of common colds

would not be complete without reference to the vaccinc treatment. While the exact value of such therapy has not been determined as an abortive treatment or as a procedure that shortens the course of the disease, the enthusiastic recommendation of such treatment by some clinicians should be noticed. The large majority find no value in vaccines either for prophylactic or curative purposes.

#### ACUTE PHARYNGITIS

The abortive treatment of this inflammation is the same as that described for acute colds.

With a simple pharyngitis, soothing alkaline gargles should be recommended. A simple, pleasant and efficient gargle is as follows:

Gm. or Cc.

M. Sig.: Use as a gargle, every three hours, diluted with equal part of warm water.

# COUGHS

#### DEFINITION

Coughing is an expiratory effort caused reflexly by some irritation. The muscles of the lower part of the chest are most engaged in the act of coughing; hence in severe, prolonged or frequent coughing muscle tire occurs in the lower part of the chest, both anteriorly and posteriorly. The abdominal muscles also take part in this expiratory effort, and the erector spinae muscles, the serratus, and the quadratus lumborum are all utilized in a strong expiratory cough. The muscle contractions compress in all directions the lower part of the chest, and the air in the bronchial tubes is forced upward, and, if there is no obstruction, is expelled through the glottis. If there is obstruction, or even partial obstruction, the upper portion of the lungs, especially the apexes, become dilated, and temporarily, or in severe cases, permanently, emphysematone

#### CAUSES

Cough can be caused by irritation of any of the muous membranes of the air tract, by irritations of the nerves in the lung tissue, by irritations of the pharynx, by reflex irritation of the vomiting center, and by any irritation that can reach, through the pneumogastric nerve, the center in the medulla. From any of these reflex causes efferent impulses are transmitted, and the result is a cough. Irritation in the nose and ear may cause cough.

Pain and muscle tire from prolonged coughing, besides occurring in the lower part of the chest, occur in the sides, low down, perhaps in the region of the insertion of the diaphragm, and also in the back even as low as the lumbar region. These strong contractions of the abdominal muscles during coughing also aid in temporarily diminishing the capacity of the thorax by pushing upward the abdominal organs. At the same time there is a considerable force exerted downward, which may tend to cause uterine displacement, hemorrhoids and even involuntary urination.

Before coughing there is generally a deep, quick inspiration; then the glottis is partially closed and the air is propelled upward forcibly, causing friction which tends to expel anything on the walls of the mucous membrane of the bronchial tubes and trachea. Even in simple bronchiis, if there is much coughing, there will be found increased resonance in the apoxes of the lungs, as there is probably always a temporary

dilatation.

Nasal irritations may produce cough as frequently as they cause asthma. Irritations of the nasopharynx and pharynx proper frequently cause coughing, which is likely to be accompanied by retching and even vomiting. An elongated uvula may tickle the epiglottis and cause spasmodic, quick expiratory coughing. This cause, however, is rare compared with the frequency of cough caused by an enlarged lingual tonsil, whether the tonsil is hypertrophied, contains dilated blood vessels, or is inflamed. Any disturbance of this gland or lymphoid tissue may cause a tickling in this region sufficient to produce a very irritating and disturbing dry cough, which comes on sometimes in paroxysms, until a certain amount of mucus is literally scraped off. The very intensity of the cough so irritates the part, like scratching a spot on the skin that itches, as to stop the tickling sensation for a time. Irritations of the larvnx almost always cause cough. Hence no examination of a patient who coughs is complete without observation of the throat and larvnx.

#### TYPES OF COUGH

The dry bark of spasmodic croup is characteristic. The noise is low pitched, like a bark. If it is husky there is mucus or membrane present.

The cough of bronchitis can be of all descriptions it may be dry and nonproductive, or moist and produc-

tive. Pain in such cough (the same is true of grip) is referred under the sternum, and is due largely to the vibrations of the inflamed mucous membrane of the trachea and perhaps larger bronchi caused by coughing.

The cough of pneumonia is at first somewhat painful, and the pain is referred to the affected side, near the nipple. This cough may be dry at first, but is soon productive and generally should not be discouraged.

The cough of pleurisy is nonproductive and undesired, and as it is repressed, is never loud. It causes pain referred to the affected side. There is nothing to expectorate, and it should be discouraged and stopped.

The cough in the first stages of tuberculosis is often dry and catchy; it is a hack. There is no great intensity to this cough, and no necessity for it, and it should be discouraged. As soon as there is much local brouchial catarrh the cough should, as it is then productive, not be discouraged, except at meals, and in the presence of others; that is, such patients should be taught when to cough. In laryngeal tuberculosis, the ulceration of the cords produces usually a peculiar creaking caugh.

The cough of asthma is a wheezing affair accompanied by all sorts of rattlings; the same type occurs in a stuffy, asthmatic bronchitis. This cough is generally not harsh.

The nervous cough usually consists of a single effort repeated often from time to time with monotonous regularity.

The coughs of different persons vary. Some always cough with great intensity, and others easily and lightly. Older persons seem to raise mucus and pus from the bronchial tubes with difficulty, and it takes a great many coughs to raise the sputum for expectoration. Young children cough easily, but generally swallow their sputum. Very weak patients will hardly expectorate at all. In such cases the foot of the bed may be raised at night; also when they cough while in bed, these patients should turn onto the side or stomach in order to raise the sputum, or they should lean over in order to have gravity aid as much as possible the expulsion of the secretions. The cough of pertussis occurs in showers or paroxysms, and at the height of the disease the glotti closes during inspir-

ation, and the air is sucked in through a more or less narrow slit, giving the characteristic "whoop."

Persons coughing very hard, as typically in whooping cough, but also in emphysema and in the severe bronchitis of strong, sturdy men, will cause a great deal of cardiac disturbance by retarding the flow in the large vessels of the thorax, thus increasing the work of the heart, especially of the right side. Such coughing can force backward the blood in the large veins thus congesting all the organs, notably the eyes, face and head. Whooping cough can occasionally cause a cerebral hemorrhage or a hemorrhage into the eyes. These patients may not infrequently have nosebleed, and even vomit blood. The heart becomes dilated by severe coughing, but generally such enlargement is only temporary.

Cough, says Horatio C. Wood (J. A. M. A., April 4, 1931, p. 1142), is a reflex movement, starting with a sensory irritation that is conveyed to the respiratory center from which is sent out a motor impulse to the diaphragm. Morphine breaks this reflex are by depressing the respiratory center, but the reflex are might just as well be interrupted peripherally. There are available some volatile substances that possess a certain degree of local anesthetic power and which can be inspired into the trachea and bronchi. Foremost among these is menthol. The addition of this drug to steam inhalations will often exert a most happy effect in abating a cough. From 3/2 to 1 grain (0.03 to .006 Gm.) of menthol may be added to a pint of hot water and the vapor inhaled:

The following combination also yields good results:

Compound Tincture of Benzoin 30/0 fils i

M. Sig.: A teaspoonful in a pint of boiling water, inhaling the vapors.

For relieving a cough, ethylmorphine hydrochloride, from ½2 to ½ grain (0.005 to 0.008 Gm.), is very efficient and much less habit forming than morphine.

The most certain clinical relaxants of bronchial spasm are epinephrine and ephedrine. To prevent dangerous arterial constriction from these drugs it is recommended that they be given with glyceryl trinitrate.

#### ACUTE BRONCHITIS

Whether bronchitis occurs in an adult or in a child, the patient will recover more quickly if he remains in bed for one or more days.

The prophylactic treatment is the same as for acute coryza, and these treatments will relieve the congestion in the bronchial tubes and promote expectoration, if the inflammation is not aborted. The cough is at first nonproductive, but as soon as mucus begins to be plentifully secreted the cough is productive, the tightness of the chest is relieved, and the patient feels better. One of the best promoters of a free mucous secretion is ipecac. A few drops of the syrup of ipecac is given every hour, unless nausea is caused, or from 0.03 to 0.06 fm. (about ½ to I grain) of the powdered ipecac may be given every two hours. The ipecac should never be pushed to the point of causing uncomfortable nausea. The dose should, therefore, as suggested, be small.

In the second stage of bronchitis there is no expectorant that seems to work so well as ammonium chloride, and the dose should be about 0.25 Gm. (4 grains) every two hours. The bad taste of this drug may be well covered up by giving it in a sour mixture, as the syrup of citric acid and water. If the cough is excessive and more than the secretion calls for, there is possibly no better method for its control than to give small doses of codeine sulphate. This may be combined with the ammonium chloride in a sour mixture, as:

$\mathbf{R}$	Codeinae s	ulphatis	0 20		gr. iv	
	Ammonii c	hloridi	5		3 iss	
		i citrici		or	fl3 i	
		q. s.			fl3 iv	
M.	Sig.: A teas	poonful, in wa	ater, every	two	or three	hours.

This prescription is for an adult, but it may be readily modified for a child according to the age. If the codeine is not wanted, it may be omitted. If it is desired to give the ammonium chloride less frequently, the dose may be made larger. If a sweeter mixture is preferred, the svrup of folu may be substituted for

the syrup of citric acid, or both the syrup of citric acid and the water may be omitted and the syrup of

wild cherry substituted.

If the larynx is inflamed, the inhalation of simple steam, or of medicated vapors, may be of value, but a patient with laryagitis of any type should be under very careful observation. The steam for inhalation may be modified by adding to the boiling water oil of eucalyptus, 5 drops to the pint, or tincture of benzoin, half a teaspoonful to the pint.

If the expectoration becomes more profuse and seems not to stop readily, terpin hydrate is of value. The dose is 0.30 Gm. (5 grains) about four times a day. This may be given in tablet or in powder; solutions are unsatisfactory as it is very insoluble. If deemed advisable it may be combined with codeine in

small doses.

If the coughing persists longer than a week, the sputum should be examined to determine what germs are present. If it proves to be a simple bronchitis, but prolonged, sodium iodide in small doses may be beneficial, especially if the patient is at all astimatic, or if he is an elderly person. Fresh air, good food and iron are always of value in treating all kinds of bronchitis. If the patient is a child and the nutrition is poor, plenty of good food, rich in fats, should be supplied. A bronchitis that will not stop must be treated as a pretuberculous stage of tuberculosis, and the patient should receive climatic, or open air rest cure and sun bath treatment.

It should be emphasized that a patient with bronchitis is not properly supervised unless the temperature is taken, regularly and frequently. A patient with a fever should remain at home, if he wishes to avoid complications that readily occur from an acute bronchitis or grip. The school nurse or the medical inspector should always take the temperature of a coughing child. If a child has any fever, he should be sent home and the family ohysician summoned.

#### ASTHMA

The disease asthma should be dissociated from conditions which are termed asthmatic. A patient may be asthmatic from various causes, but the term asthma should be limited to the disease or condition itself, i, e., periodic attacks of bronchial spasm. More or less continued dyspnea, with or without whistling râles, and with or without acute attacks of asthma, may be caused by cardiac disease, cardiac asthma: by renal insufficiency, renal asthma; by plethora, causing attacks of acute hyperemia of the lungs: by arteriosclerosis; emphysema; diabetes; thyroid disturbances, and by the various anemias. Spasmodic asthma may be caused by bad heart attacks; by acute toxemia from renal insufficiency; by exacerbations of gout, probably due to a toxemia from nitrogenous malmetabolism; by acute indigestion, and by gastro intestinal irritants causing a swelling of the mucous membranes of the bronchial tubes, really an urticaria. This swelling of the mucous membrane of the bronchial tubes has been caused by injections of horse serum,

#### CAUSES

In every case of hav fever or asthma, the most careful history should be taken of the individual from childhood to the time of examination. His early childhood health and peculiarities, his condition during adolescence, all the diseases that he has had, and all the personal peculiarities or tendencies toward allergic reaction should be studied. Also, all tendencies to allergic reactions in his immediate family should be noted. Focal infections, especially, must be sought and eradicated. The most frequent of these, of course, occur in the mouth, nose and adjacent sinuses. The patient should be studied from the standpoint of dysfunction of the endocrine glands. Symptoms of allergy not infrequently appear during the changes in these glands, at puberty, and especially at the menopause. The history should include a careful study of the patient's reaction to foods, dusts and pollens; the time of year in which the hay fever or asthma occurs, and the relation of such disturbances to association with animals, to particular rooms or regions, and to climates. Very careful questioning of the patient and the family will suggest investigations of particular classes of substances, and will minimize the labor of making many protein tests. Besides the many foods that may cause allergic reactions, it should not be forgotten that some condiments, as pepper, mustard, ginger and other spices may cause astimatic reactions. To bacco may be an associated cause, whether smoked or simply inhaled. Some drugs are prone to cause symptoms of asthma or lay fever in certain individuals. Alcohol may increase the tendency to asthma, especially when taken with foods, though occasionally alcohol will temporarily relieve asthmatic symptoms. Sometimes pleasant odors, as perfumes, especially of toilet articles, may cause asthma, and it should never be forgotten that orris root powders are frequent causes of asthma and hay fever symptoms.

Colitis and intestinal putrefaction may play an important part in asthma. It may also occur in acidosis and in various types of pseudo-angina. It may accompany psychoses, often with high blood pressure, and it may

occur in tuberculosis and syphilis.

Skin tests of various pollens and various foods, dust, animal dust and feathers are now largely made, to start with, in groups, and if there is no reaction to a group, it is unnecessary to test all the individual members of that group. If there is reaction to a group of proteins, pollens or other substances, then the group may be divided into subgroups or units and the tests carried on to ascertain the exact substances that really cause the trouble.

If asthma is due to a food, before trying skin tests, which are not always accurate, one should try all kinds of restrictions. First, the proteins should be withdrawn. Then, after a short fast, elimination diets that may be conveniently followed have been planned. One begins with simple substances and gradually adds one food at a time until the inciting substance is detected. Such diets have been listed in excellent small books by

Rowe and by Warren T. Vaughan.

R. A. Kern (Ann. Clin. Med., September 1923, p. 75) finds that the foods that most commonly cause asthma are egg, milk and cereals, and next shellfish and fruits. The druge that most frequently cause it are quinine, acetylsalicylic acid and ipecac. For instance a baker may become sensitive to the proteins of flour, a tailor to wood, an apothecary to some powdered drugs. Wood workers may become sensitive to wood dust, and boxwood is the most common offender. Asthma due to

house dust and that due to feathers is apparently usually nocturnal. An asthmatic attack may follow a heavy meal, simply from an overfilled stomach. Kern warns that the intracutaneous test for allergy requires skill, and the method is often dangerous. The cutaneous tests are applied to a scratch through the derm that does not cause bleeding, usually on the flexor surface of the forearm. The protein to be tested is dissolved in a drop of tenth normal (0.4 per cent) sodium hydroxide solution. A positive reaction is an urticarial wheal 0.5 cm, or more in diameter surrounded by erythema. Kern's method of testing dust is to half fill a 2 ounce, wide-mouthed bottle and then add sufficient 14 per cent alcohol to make a thin mud. This is allowed to stand for two days, and a drop of the upper fluid is used in the skin test.

He notes that asthma may be caused by intestinal indigestion, which means that the absorption of products which may at one time not cause allergy, when meeting in the blood with some other irritating substance, as any one of the many causes of asthma or hay fever, will cause an anaphylactic reaction. Nasal causes, as polyps, and simus infection or ethnoid infection, must be com-

sidered and be removed, if present.

Focal infection is not an infrequent cause of asthma. and especially mouth infection, and the removal of diseased tonsils and diseased teeth will not only prevent the recurrence of colds, but will sometimes relieve asthma. One of the most common causes of asthma is bronchitis, and such an asthma is probably often bacterial, owing to the germs in the bronchial secretions. G. T. Brown (J. A. M. A., May 28, 1927, p. 1693) believes that bacterial asthma may be a nonsensitive asthma. In other words, it may be characterized by a great deal of cough between the asthmatic paroxysms, with an expectoration of greenish-vellow or purulent sputum and perhaps a thick nasal discharge, whereas an allergic asthma causes itching of the eyes and watery secretions of the nose and more watery secretions from the bronchial tubes. There seems to be no question, however, that these two forms of asthma may coexist.

L. Clendening (Ann. Clin. Med., September 1924, p. 230) concludes that infection of the bronchi in cases of

asthma is of long duration with at first recurrent colds. then an all winter bronchitis, and later more or less bronchitis all the year round. Later in life, between 50 and 70 years, the bronchial walls become infiltrated and lose elasticity, and the walls may stretch and form pockets and regions of bronchiectasis with our pockets. Bronchial asthma may occur and emphysema may result. Some bronchi may become contracted, and hence cause more spasm and dysonea. The heart easily becomes tired in this form of disease. M. Solis-Cohen and Rubenstone (Ann. Clin. Med., January 1926, p. 574) find that asthma due to an involvement of some part of the respiratory tract can be overcome only by raising the bactericidal power of the patient, which is best done by using vaccines that grow well in the patient's own blood. Such blood shows inability to fight this particular organism. The sputum for examination should be collected during the night and early morning. and cultures and tests made with the patient's blood.

The relation of asthma to an enlarged thymus in young children should be studied by means of the roentgen ray. Roentgenograms are often essential to eliminate sources of pressure and growths in the thorax. M. M. Peshkin (Am. J. Dis. Child., December 1926, p. 862) studied 100 children with asthma and found that 22 per cent had had eczema in their younger life; 7 per cent had had urticaria, and 2 per cent had had angioneurotic edema. Seventy-nine of these patients were protein sensitive, and of these, 22 had eczema, All the children who reacted to fish or meat proteins gave a history of eczema in infancy, A. H. Rowe (Arch. Int. Med., April 1927, p. 498) found that house dust extracts elicited a reaction in the scratch test in 42 per cent of 162 patients with asthma. The reaction to dust may be due to a combination of several elements, such as animal pollen and fabric dusts. G. T. Brown (Ann. Clin. Med., March 1927, p. 893) describes several cases in which there was multiple sensitiveness in bronchial asthma. Therefore, in making tests, even if a distinct sensitization is found, other sensitizations must be eliminated.

Bret Ratner (J. A. M. A., Feb. 21, 1931, p. 571) maintains that a child suffering from asthma must be viewed from the standpoint of hypersensitiveness. A

carefully studied and thoroughly analyzed history is essential. This should include not only the history of a typical attack in its relation to foods, contact with animals, the season of the year, the time of occurrence, and the locality, but also a broad and general history of the case as a whole. In addition to the history, a complete physical examination and laboratory tests such as chemical examination of the blood, cytologic studies and roentgenograms should be made and from 300 to 400 protein skin tests performed on each child by the scratch method. He believes that etiologic factors such as sensitization in utero, sensitization by passage of antigen through the intestinal tract, and sensitization through inhalation of antigenic dusts are of paramount importance.

### SYMPTOMATOLOGY

An attack of asthma generally occurs at night, and may be preceded by headache, some symptom of indigestion, mental depression or nervous irritability. There is at first some slight dyspnea and a short dry cough. The dyspnea and consequent cardiac distress increase, and the agony suffered by these patients can not be understood unless one has seen them suffering from an attack of this terrible disease. The agony is almost as great as that of acute cardiac dyspnea, although there is not much mental anxiety. The patient may be pale or almost livid, and the expression of the face shows the suffering due to attempts to inspire, and then to expire, through the contracted bronchial tubes. The muscles of inspiration being stronger than the muscles of expiration, for a time more air enters the lungs than can be expired, and little by little there is increased chest distention. Percussion shows hyperresonance. The greatest amount of wheezing, as shown by the stethoscope, is in expiration, and the expiration is prolonged in the attempt to empty the lungs and prepare them for the next inspiration. If the bronchial secretion increases, as is usually the case, moist râles may also be heard, and, after a series of spasmodic efforts, the cough brings up white glairy mucus.

The length of these attacks of acute asthma, if untreated, varies from an hour or two to all night, and sometimes an attack may last several days. Occasionally the attacks last for many hours, or even days, in spite of all treatment, and any temporary relief given by powerful drugs may not prevent the resumption of the asthmatic spasm the moment the patient is out of the influence of the drug. The amount of dyspnea and suffering and the seriousness of the attack do not bear a close relation to the amount of wheezing that is heard. A patient may not suffer greatly from dyspnea so long as he is sitting upright, and yet wheeze like a decrenit old horse.

The longer the paroxysm lasts and the more intense it is, the greater the danger of permanent injury to the heart and the greater the danger of distention of the chest so injuring the lung tissue as to make the emphysema permanent. Even after repeated attacks most patients do not have any cardiac injury or any lung injury, but this is doubtless because most of those who suffer from acute asthma are young. patients have more or less lasting bronchitis, cardiac debility and more or less constant dyspnea and often emphysema. It is rare for a patient to die during an attack of acute asthma, but the condition should always be considered serious, as it is difficult to decide how much future disability is caused by the prolongation or repetition of such serious disturbance of the vital functions of respiration and circulation.

Acute attacks of asthma may occur every night for a series of nights, and then not for a long period, or after one attack there may be no more for some time, or they may occur rather periodically, or they may recur only at certain periods of the year or in certain places. These last are likely to be due to nasal irritations. The attacks may also occur frequently for several years, or even for a lifetime.

### GENERAL TREATMENT

The opinion is gaining ground that practically all asthma is a form of anaphylaxis. The physician should endeavor to ascertain what type of hypersensitiveness each case presents. All contacts of the patient with animals should be investigated, including the relation of the asthma attacks to bels, cushions, pillows, furni-

ture (horsehair), and to articles stuffed with rabbit fur, chicken and goose feathers. The relation of the asthma attacks to fruits, flowers, sachets, orris root or

insect powders should also be investigated.

In determining the cause of asthma in any patient, it is well to plan a systematic examination as outlined by Gottlieb. There should come first examination of the nose, throat and teeth and roentgen ray examination of the head to determine the presence or absence of pituitary enlargement, and disease in the alveolar processes of the jaws. Search should then be made in other parts of the body for infected areas or absorption of toxic material, such as may occur from a diseased appendix, gallbladder, prostate, uterus or ovary. Bacteriologic examination of the nasal discharges, pus from the tonsils and tooth sockets, bronchial secretions and stool should follow. Suspensions of the individual bacteria isolated from the various secretions and discharges should be prepared for the purpose of making skin tests. These skin tests are also to be made with stock bacterial proteins, epidermal and food proteins, and pollens.

The treatment of this troublesome disease, or condition, will never be a success unless the cause has been determined, and, if possible, removed. Hardly any patient with any disease should receive a more careful general examination than the patient with asthma. The lungs must be carefully examined for bronchitis and emphysema, and more serious conditions found or eliminated, and the blood pressure taken. The digestive ability of the stomach and intestines should be investigated, the urine should be examined, and all possible reflex causes sought in the throat, nose or ears, If all tangible causes of the asthmatic attacks have been eliminated, a careful analysis of the excretion of the various salts and solids in the twenty-four hours' urine, on a known diet, should be made. Even careful examinations of the feces, on a known diet, may give conclusive evidence of the cause of the toxemias that give rise to asthma. Finally the response to cutaneous sensitization tests with various food substances prepared as extracts for this purpose may be thoroughly studied with a view to finding some substance to which the patient has an idiosyncrasy.

### SENSITIZATION

As pointed out by I. Chandler Walker and others, patients with bronchial asthma who are sensitive to specific substances have the onset of their asthma early in life, and are not usually subject to chronic bronchitis or to cardiorenal disease. Those not sensitive have asthma after 40 years of age and have the two complications mentioned. The sensitive patient will usually be found to respond with a positive skin reaction to one of the following kinds of protein: horse dandruff, staphylococci, wheat, pollens, cat hair and a few verv common foods.

The skin test is made as follows: A number of small cuts, each about one eighth of an inch long, are made on the flexor surface of the forearm. These cuts are made with a sharp scalpel, but are not deep enough to draw blood, although they do penetrate the skin. On each cut is placed a protein and to it is added a drop of tenth-normal sodium hydroxide solution to dissolve the protein and to permit of the rapid absorption. At the end of a half hour the proteins are washed off, and the reactions are noted, the inoculated cuts always being compared with normal controls on which no protein is placed. A positive reaction consists of a raised white elevation or urticarial wheal surrounding the cut. The smallest reaction that can be called positive must measure 0.5 cm. in diameter.

The intradermal test is preferred by many who are expert at this method of testing. This test must be done very carefully, else subcutaneous injections will

be made.

W. W. Duke (Am. J. M. Sc., November 1923, p. 645) well urges that a patient should be kept under observation by the physician for one hour after the injection of a pollen extract, and if he complains of itching, or if there is redness of the skin, swelling of the tongue, a feeling of compression in the chest, or coughing or wheezing, he should immediately be given 0.5 cc. of epinephrine solution (1: 1,000) subcutaneously. If the allergic symptoms do not abate in three or four minutes after this injection, he would repeat it, and if in several more minutes improvement has not occurred, he would give a third injection of the epinephrine with one-hundredth grain of atropine sulphate.

He says that every unpleasant reaction that has occurred in his patients in the last seven years has been stopped by these injections.

# DRUGS IN ASTHMA

Perhaps the most frequently helpful drug in preventing the recurrence of asthma is an iodide, probably because most asthma is due to an involvement of the air passages, and this drug is specifically a stimulant to the mucous membrane of the nose, throat and bronchial tubes. If any chronic disturbance is located in these mucous membranes the iodide tends, first, to increase the exudate from them and then to make the mucus more liquid. While at first apparently irritant, the iodide soon relieves congestion of these membranes, often, sooner or later, cures a chronic congestion and causes the membrane to become healthy. Hence the frequency of success from iodide simply emphasizes the necessity of a careful examination for, and the removal, if found, of any nasal obstructions or irritations. After such removal, a sensible treatment to prevent the recurrence of attacks would be the prolonged administration of iodides, of which large doses are seldom needed, or if the history of the attack shows long standing of the disease, the treatment of the neurosis by bromides is advisable, and here again the dose should not be large.

After any local cause present in the upper air passages has been removed and treatment either by iodides or bromides has been started, if either one is deemed advisable, anything that will improve the general health of the individual should be utilized. An occupation in which there is an atmosphere of dust or other irritant should be changed for one more suitable. Perhaps indoor work should be changed for outdoor work, or perhaps the climate or location should be changed. Any indigestion, gastric or intestinal, should be corrected; constipation should be prevented; anemia should be treated, and insufficiency of the thyroid, if present, should be noted and modified.

If astima occurs at certain periods of the year as does hay fever, the preventive treatment is the same as for hay fever. Anything that will reduce the nasal irritations and congestions will relieve the asthma, and

any change in location that will prevent the hay fever will generally prevent the asthma. To just what locality or climate an asthmatic patient should be sent is difficult to determine. Also it is impossible to predict that, because one natient is benefited by a sojourn or residence in one particular place, that place will be beneficial to the next patient. Theoretically, regions free from dust and vegetation should be the regions to prevent attacks of asthma. Sea voyages are sometimes beneficial and sometimes not. The decision as to whether or not benefit will be derived from certain regions may often be determined by a careful investigation into the condition of the patient's mucous membranes and the condition of his circulation. Climatic changes are very unsatisfactory, unless the causes of the asthma have been determined and eliminated

Anything that would tend to make the circulation better in the mucous membranes of the upper air passages and diminish congestion and tumefaction of the mucous membranes of all the air passages will tend to prevent recurrences of asthma. Cardiac insufficiency, of course, should be properly treated, and whether the heart needs digitalis or the arteries need glycerly trinitrate or nitrites continuously, or whether the general good effect of ergot on the circulation is needed (and asthma may sometimes be prevented by ergot) must be determined by a careful study of the individual patient. If the blood pressure is low, besides digitalis and strychnine, if advisable, quinine is often of benefit, as it is a tonic and slightly raises the blood pressure:

is a tonic and slightly raises the blood pressure.

Insufficiency of the kidneys as a cause of asthma should be treated by the proper diet and the prevention, if possible, of nitrogenous toxemias. Such asthma is an indication of nitrogenous poisoning. The asthma due to gout is often best combated with thyroid, and when there is insufficiency of the thyroid in young individuals, which may be recognized by well known signs, such as amenorrhea or scanty menstruation in women, an unusual and undesirable increase of fat, a dry condition of the skin, and a tendency to nitrogenous poisonings, the asthma will be benefited by small doses of thyroid, perhaps, coincidentally administered with small doses of thyroid, perhaps, coincidentally administered with small doses of thoroid, perhaps the provider and the p

Intestinal putrefaction, colitis, acidosis, high blood pressure, or any other condition associated with the asthma, must be taken into consideration and properly treated. The blood should be carefully examined in all lines, both as to cells and as to the character of the plasma. The relation of eosinophils to the asthma or to the conditions present should be studied. Sometimes, perhaps from profuse expectoration, insufficient intake of liquid, especially when large amounts of epinephrine are injected (which causes the tissues to lose water), may cause the blood to become very concentrated so that the peripheral blood shows high hemoglobin percentage and a high red count. Such a condition may be benefited by the administration of an increased amount of the normal salts of the blood and a larger intake of water

In all hypersensitization there is likely to be a disturbance of the calcium metabolism, and in many spasmodic conditions disturbance of the parathyroids is a factor. Therefore, in many cases of astima the administration of calcium is a valuable sedative-to the nervous system. In most instances, milk, with its large calcium content, becomes a valuable food. When the patient sleeps poorly, alkalis may be of advantage and prevent the necessity of hymotics.

### TREATING THE PAROXYSM

The best treatment of the paroxysm of asthma must be decided by a careful study of each individual patient. There is no one best treatment for the asthmatic attack. The drug that most frequently is successful in rendering the patient comfortable and shortening the paroxysm is, of course, morphine, but before the physician begins the treatment of the asthmatic attacks with morphine he should have exhausted his other resources, as he is not sure that he can cure the asthma, even if he removes the reflex cause, and such patients readily acquire the morphine habit. If a patient is incurable under the surroundings and conditions in which he must live and no other drug will relieve his suffering, he doubtless has the right to receive morphine, even if he does form the habit.

In endeavoring to abort or shorten the attacks we may have recourse to narcotics, which relieve the paroxysm by inhibiting the reflexes and dulling the receptive centers. Such drugs are morphine, bromides, chloral, and chloroform by inhalation.

We may use drugs that dull the peripheral nerves and prevent their susceptibility to the irritation from which they are suffering and thus abort the paroxysm. Such drugs are mostly of the atropine group, such as belladonna, stramonium and hyoscyamus. The effective action is that of atropine, and doubtless atropine, and perhaps scopolamine (hyoscine), will do all the good that the crude drugs can do, although inhalation of the fumes from burning stramonium leaves has been used with success for centuries.

There is also the treatment with such drugs as cause muscular relaxation by prostration. These are emetics, and tobacco with patients who are not used to its action

The next group of drugs whose action we consider in the treatment of asthmatic attacks are vasodilators. These drugs not only dilate the peripheral blood vessels and therefore relieve congestion in the mucous membranes of the respiratory tract, but also prevent muscular spasm. Such are, of course, the uitrites in the form of amyl nitrite and sodium nitrite, and glyceryl trinitrate. The iodides will also cause lowered blood pressure, but are hardly of value during the attack.

One of the most successful drugs in the treatment of the asthma attack is epinephrine, which is best administered in aseptic solution intramuscularly. The relief may be almost instantaneous, or it may not occur for ten, fifteen, or even twenty minutes. The first effect is, of course, a slight constriction of the arterioles, but soon the secondary effect of vasodilatation occurs, and especially does it relax the bronchial tubes. With this relaxation the bronchial secretions are more easily expectorated, and relief is sooner or later complete for that paroxysm. The dose is often stated to be 10 minims (0.60 cc.) of a 1:1,000 solution. This dose is large. It is better to begin with half this dose, and many times still smaller ones, 3 or 4 minims (0.18 or 0.24 cc.), will be successful, especially if the dose must be often repeated. The dose of 1 cc. (15 minims)

sometimes mentioned is certainly dangerous, and even 10 minims (0.60 cc.) may, in certain instances, cause very serious symptoms and death may result from sudden dilatation of the heart. An action not much mentioned is a depressant action on the respiratory center, so that if morphine or opium drugs are administered with or soon after the epinephrine, serious symptoms of collapse may occur. Mild, unpleasant reactions are evidenced by nervousness, pallor and tremor of the hands. The administration of epinephrine may be repeated several times in twenty-four hours without any serious symptoms, if the dose is not too large. It may be given for long periods in one or more daily doses without causing serious symptoms or an epinephrine habit. However, there is a certain periodic desire for the action of the drug if it has been long used, although the timing may be largely due to the periodicity of the asthma. Sometimes it may be wise to dilute the epinephrine solution to be used with physiologic sodium chloride solution. This is hardly necessary when the drug is administered intramuscularly; it is more important when it is given subcutaneously, which is not as good a method, as it causes marked contraction of the subcutaneous vessels and absorption may be delayed.

Solutions of epinephrine may be sprayed on the mucous membranes of the nostrils or throat, or into the larynx, or an epinephrine preparation in tablet form may be dissolved and absorbed in the mouth. The action is of course immediate, and sometimes or is the relief. For the nostrils epinephrine spray solutions of from 1: 10,000 to 1: 5,000 (diluting with a mild alkaline solution) may be used. In the throat and larynx a strength of 1: 3,000 may be used. Digitalis is sometimes of advantage in these attacks, even if there

is no cardiac lesion or cardiac debility.

The active principle of the posterior lobe of the pituitary (solution of pituitary) may be used as an injection, either alone or combined with epinephrine, for asthma. This should be administered subcutaneously. Its effect is more prolonged than that of the epinephrine. It is best used in conditions in which the blood pressure is low.

As ephedrine has so recently come into prominence as of value in asthma, it is important to give it more than passing notice. It has been accepted by the Council on Pharmacy and Chemistry for inclusion in New and Nonofficial Remedies. The drug comes from China, and is an alkaloid that has been obtained from ma huang which was long ago discovered and has recently been investigated by Chen and Meek, and by Chen and Schmidt. Its action is similar to that of epinephrine, but less toxic, and the effects are more prolonged. It stimulates the sympathetic nervous system as does epinephrine; causes a rise in blood pressure from vasomotor constriction and some cardiac stimulation, and relaxes the bronchial muscles. It also causes relaxation of the intestines, and in some instances, even in small doses, may cause temporary paresis of the bladder. Locally applied in from 4 to 10 per cent solutions, it causes dilatation of the pupils in from forty to sixty minutes, which lasts from five to twenty hours (Chen and Schmidt: J. A. M. A., Sept. 11, 1926. p. 836). It does not cause cycloplegia or any change in the intra-ocular tension. In the nose and throat it is now much used to cause shrinkage of the mucous membranes, which occurs within five minutes and persists for nearly three hours. The rise in blood pressure when it is given internally may last for several hours. This drug may be given subcutaneously, but it acts when given by the mouth. It occurs as the alkaloid, as the hydrochloride, and as the sulphate. It is offered in capsules in two strengths, 0.025 Gm. (3/8 grain) and 0.015 Gm. (1/4 grain), and in one ounce bottles as a liquid in 3 per cent solution and in ampules.

When successful, the great advantage of this drug over epinephrine is that it acts when taken by the mouth and does not necessitate hypodermic administration.

It is not always successful in asthma.

Citrated caffeine or strong coffee, or strong decoctions of tea are of benefit during the asthmatic attack in some individuals. The favorable action of caffeine must be due to the cardiac stimulation and possibly to stimulation of the respiratory center,

Strychnine given hypodermically has been much recommended for the asthmatic attack. While it generally fails, it sometimes is quite beneficial to patients who

have bad heart action. A combination of strychnine, morphine, and atropine given hypodermically sometimes seems to act better than a mixture from which the strychnine is omitted.

### INHALATIONS

Almost from ancient times paroxysms of asthma have been treated by the inhalation of tumes from burning medicinal substances. For this purpose the medicared substance may be in the form of cigarettes, powder, cones or papers. Sometimes the fumes of these burning powders are directly inhaled, or the patient's bedroom is allowed to become filled with the fumes. Of ten the attack is relieved by the inhalation of steam, or the vapor of boiling water in the room of the patient adds some relief. Sometimes liquid medicaments are added to boiling water in various forms of apparatus for inhalation. Most popular, however, and most frequently used are the powders or papers or pastlis that are burned and inhaled directly.

Probably nearly all the powders or papers ordered by physicians for inhalation for asthma and almost all of the patented preparations and nostrums contain niter (saltpeter) and stramonium, or belladoma, or other atropine-containing drugs. The action of the niter, i. e., potassium nitrate, fumes is to cause relaxation both of the blood vessels and of the bronch. Papers are saturated with solutions of potassium nitrate, and when dry may be rolled in the form of a cigarette and smoked, or may be burned in any other form, and the fumes are beneficial to some patients. The addition of potassium nitrate to other medicinal powders causes them to burn more readily and give off their fumes.

Stramonium (leaves) is the most frequent form in which the alkaloid atropine is administered by inhalation. The action of the atropine thus locally applied is to dull the irritability of the peripheral nerves in the nose, throat and larger bronchial tubes, and thus by relieving irritation it tends to relieve spasm. At the same time the atropine acts as a circulatory stimulant.

Various combinations of drugs are used for inhalation for asthmatic persons, many of which are nostrums (but have been analyzed) and have more or less efficiency in relieving the attack, because of the potent drugs often recklessly employed. The asthma nostrum vendor is looking mainly for immediate results, and he cares little what the danger to the patient may be or how strong a dose he gives. Consequently, he orders sufficient amounts of the drugs to cut short the asthmatic attack. Therefore, the prescription whiching a physician is willing to write may not be so successful in a certain case as the nostrum temporarily may he.

### PROTEIN IMMINIZATION

In desensitizing by injection, Bret Ratner (J. A. M. A., Feb. 21, 1931, p. 571) recommends the injection of minute doses subcutaneously. The dilution injected should always be less than the point of reactivity. For example, if the child reacts to a dilution of 1:1,000, the treatment should start with a dilution of 1:0,000. The increase in dosage is graded carefully.

It is also possible to desensitize against foods by giving gradually increasing amounts of the foods by mouth.

W. W. Duke (1. A. M. A., March 15, 1930, p. 767) recommends giving the pollen subcuticularly. Reactions are reduced to an almost negligible factor through control of the dissemination of the pollen from the site of inoculation by the use of tourniquets above the site of inoculation and the admixture of epinephrine and ephedrine with the pollen solutions. He avoids intraverous injections.

Walker found that asthmatic persons who were sensitive to proteins in horse dandruff or cat hair were relieved of attacks during a series of subcutaneous injections with these proteins. Treatment was begun with a dilution of the protein next higher than that to which the patient reacted, sometimes as high as 1:100,000. The strength of the dilution was then slowly and gradually increased, the physician waiting for a subsidence of response following each injection. The largest number of doses required was forty-two and the average number was eleven. The protein extracts are injected intramuscularly with all the precautions that accompany any surgical procedure, including thorough cleansing of the skin, sterilization of the syringe by boiling, and absolute surety that the injection is not being made directly into a blood vessel. Nonspecific

proteins are used successfully, especially milk. Autogenous vaccines administered in the usual manner with the usual dosage have been successful, but unfortunately, many times all vaccine injections fail, especially in bronchial asthma

Harry Beckman (J. A. M. A., Nov. 22, 1930, p. 1582) points out that in a number of acidotic states such as starvation, during acute infectious diseases and during treatment with whisky and acetylsalicylic acid the asthma is somewhat relieved. Peshkin has renorted relief by means of the ketogenic diet.

Oxygen inhalations have sometimes been used by asthmatics, and with relief. This, however, is not very dissimilar to breathing the outside air, and will, of course, partly relieve the oxygen starvation, A patient who must go to the window and gasp for breath should, perhaps, have an oxygen tank in his room to use when he needs it.

A group of patients with pollen asthma were studied by Leslie N. Gay (J. A. M. A., May 6, 1933, p. 1382). They were placed in an air-conditioned atmosphere with the temperature ten degrees below that outside and the humidity was maintained at 40 per cent.

Striking relief was given to these patients within twelve hours after admission to the room.

Tell Nelson et al. (J. A. M. A., May 6, 1933, p. 1385) found that if patients with pollen asthma are provided with filtered air for a sufficient length of time, their subjective symptoms of asthma will be relieved. The objective symptoms of asthma disappear less readily.

# HAY FEVER

Hay fever is most frequent in the late summer and early fall months, but it may occur at other times of the year in different climates, depending on the susceptibility of an individual to various pollen-bearing plants. While bacteria may increase the intensity of the disease, or may cause a patient to become susceptible to it, still seasonal hay fever is probably always caused by irritating pollen. The type that occurs the year round (perennial hay fever) is due probably to foods or dusts.

The disease is present especially in regions where pollen-rich plants predominate, and occurs only when these plants have reached the stage of disseminating the pollen, or when the pollen is artificially introduced into the nostrils of a susceptible person. When a patient is removed from all source of pollen, or when the offending weeds are destroyed in the region in which the patient lives, hay fever does not occur.

Hay fever is no respector of persons, and may occur at any age, in both sexes and in any civilized race. It is more frequent, however, in males, and more frequent in the white race than in the Negro. The age of greatest susceptibility, or the age at which most cases develop, seems to be in the decades from 10 to 40. This age of greatest incidence and the reason that males are more affected than females may signify the age and sex most exposed to pollen.

While the pollen of many plants may cause hay fever reaction when applied directly to the nostrils, it is only the wind-borne pollens that need to be considered in hay fever. Scheppegrell noted that it is characteristic of hay fever weds that they have no attractive flowers or perfumes, and these hay fever plants are "the ragweeds, wormwoods, cockleburs, careless weeds and grasses." In the United States, the spring type of hay fever is caused by the grasses, while the fall types are caused more by the ragweeds, the cockleburs and the wormwoods. Goldetroid is an occasional burst and the wormwoods. Goldetroid is an occasional

but not a frequent cause of hay fever.

According to O. C. Durham (J. A. M. A., June 4, 1930, p. 1907) the potential ragweed area is that portion of the United States east of the Rocky Mountains, except the south end of the Florida peninsula. In all parts of this region are found from one to seven species of ragweed. The Mississippi basin is the world's greatest ragweed district. Daily fluctuations of the pollen curve can be quite satisfactorily accounted for and predicted by, and on much the same basis as, the weather.

Durham also states (J. A. M. A., June 10, 1933, p. 1846) that the hay fever plants of sufficient distribution to be considered complicating factors in ragweed hay fever are hemp, Palmer's amaranth, Russian thistle, Kochia, and the various species of sage. They are confined largely to the area between the Mississippi River

and the Rocky Mountains.

Fall-pollinating grasses are a menace in the Gulf Fall-pollinating possible importance farther north. During favorable seasons in central Texas elm pollen is of clinical interest. Hemp is a local hay fever plant at Omaha. Nebraska.

### SUSCEPTIBILITY AND PREDISPOSITION

There can be no question that a susceptibility to hay fever must exist, since so few persons (1 per cent approximately) in a locality overrun with these weeds are subject to the affliction.

Cook, Flood and Coca (J. Immunol., February 1917, p. 217), after careful investigation of the subject of

sensitization, sum up thus:

 Hay fever is the clinical symptomatic expression of local hypersensitiveness. The active pollen substances are not toxins.

2. The hypersensitiveness is established spontaneously and never by immunologic process. This has been shown in two ways: first, by the observation that individuals may be sensitive to pollens of plants that are indigenous in foreign countries and with which they have never come in contact; and second, by the observation that individuals who are naturally sensitive to one protein only cannot be artificially sensitive to oncher protein, either animal or vegetable.

3. The sensitization is not directly inherited, although the tendency to spontaneous sensitization is inherited as a domi-

nant character.

4. The antibody-like substances of human sensitization are not demonstrable in the blood of sensitive persons by any of the immunity reactions. They are present in the cells of the sensitive tissues. They cannot be increased artificially by the usual process of immunitation.

5. The mechanism of the alleviating effect of specific, that is, pollen extract therapy, is the same as that of deensitization in experimental anaphylaxis. The freedom from symptoms lasts as long as the respective "antigenic" substances remain in combination with the antibody-like substances in the tissues.

Persons who are attacked by hay fever may be predisposed by some other cause than a peculiar hypersensitiveness of the mucous membrane of the nose. These patients, many times, are found to have anatomic malformations, such as hypertrophic turbinates, deviated septums, or other obstructive or irritative conditions in the nostrils with often some bacterial infection, and many of these patients are cured by the removal of these abnormal conditions. In other instances incurable pathologic changes may be present in the mucous membrane of the nose and adjacent sinuses. Furthermore, a neurotic individual may be more hypersensitive to this irritation than other persons without any assignable physiologic, pathologic or anatomic excuse.

To repeat, it is important first to clear up all anatomic deformities of the nasal tract, then to correct local infections and finally to administer combined pollen

and vaccine treatment

Hay fever due to pollen should be differentiated from similar conditions caused by emanations from animals, such as the horse, cat or dog, and from odors from certain fruits, flowers, and from ipeca and musk. Sneezing, lacrimation, coughing and asthma may occur in some persons, who have such peculiar idiosyncrasies. Bronchial asthma may develop as a separate entity, or be associated with or follow hay fever; hence its treatment often is the same as that of hay fever.

The symptoms of an attack of hay fever may begin immediately on inhalation of the pollen, or they may be delayed for a few hours; but sneezing, congestion of the nostrils, reddening and itching of the eyelids or of the inner canthi of the eyes, irritation of the roof of the mouth and throat, and soon spasmodic attacks of sneezing are the primary symptoms. Later rhinitis may occur, with conjunctivitis, pharyngitis and bronchitis. There may be temporary increased temperature, but soon there is depression, weakness, and often subnormal temperature.

### GENERAL TREATMENT

1. All predisposing causes should be ascertained, and, if possible, removed,

(a) Hypertrophic and sensitive mucous membrane of the turbinates should be removed. An obstructive and deflected septum should be corrected. An infected sinus should be cleaned.

(b) All infected areas in the mouth and throat should be treated.

(c) Although the diet should be nutritious, it should not contain any irritating substances, such as

mustard or other condiments. Tea and coffee are often contraindicated. Fish, strawberries, and any other food that is likely to cause anaphylactic irritability should not be allowed.

(d) The bowels should be carefully regulated so that toxic intestinal substances are prevented from entering the circulation and adding to the disturbing elements already present in the blood.

(e) Calcium is often of value in hay fever, as it is in hives, in angioneurotic edema, and in some forms of asthma. Calcium may be administered as fresh calcium lactate, or as the more irritant calcium chloride. If the chloride is used, it should be administered after food has been taken, and then largely diluted.

(f) An associated bronchitis should be treated as

though the hay fever were not a factor.

(g) A weakened heart should be strengthened. The persistent sneezing and the frequent coughing in hay fever always tend to weaken and temporarily, at least, dilate the heart, and a patient with hay fever generally is improved by digitals. Of the strength of the is sturdy, and if there is stretrioesterosis and hypertension, digitalis may not be indicated and glyceryl trinitrate may be of value. Strychnine is generally inadvisable, because it increases the general nervous

Campaigns in cities against pollen-bearing weeds, should be encouraged. If possible, all such weeds in the immediate neighborhood of the patient's home should be destroyed; otherwise the patient must migrate

to some pollen-free region.

3. The symptoms should be ameliorated. Most patients certify to the relief obtained from simple alkaline sprays in the nose and throat. Such treatment is well represented by alkaline tablets, consisting essentially of sodium bicarbonate and borax, dissolved in 60 cc. (2 fluid ounces) of warm water. Epinephrine sprays, in solution of 1:1,0000, are frequently of value. It may also be used as an orimment in solution of 1:1,000, and a small portion placed in each nostril. Some persons, while getting immediate relief from epinephrine solutions, later have increased congestion and extra sneezing, but the majority of patients

are benefited. Ephedrine solutions also may be used in the nostrils. Sometimes a weak menthol, or menthol and camphor, oil spray or ointment gives relief to the patient. While coatine may be used by the physician in his office, if he thinks it advisable in an individual case, such solutions should not be given to the patient, and should be used moderately by the physician. Boric acid washes and eyedrops will generally relieve the itching of the eyes and eyelids and will be soothing in conjunctivitis. If the nasal discharge is profuse and watery, atropine sulphate in a dosage of one-five hundredth grain (0.1 mg.) every two hours may be given until there is a dryness of the throat.

If there is much asthma and the patient wheezes and has difficulty getting his breath, and if the bronchial secretion is not sufficient, sodium iodide in a small dose to cause an increased secretion may be good treatment.

to cause an increased secretion may be good treatn although it invariably increases the nasal secretion.

4. The only drugs that have proved of much value in lay fever are quinine and antipyrine, and these are not very efficient. Large doses of quinine have been successful in some cases. Antipyrine in large doses has also modified the attacks, much as it may modify the paroxysms of whooping cough. During the administration of this drug the heart should be protected by dieitalis.

# SPECIFIC TREATMENT

Preventive.-Before it is decided to use a pollen extract, it is necessary to ascertain the particular pollen to which the patient is susceptible. The skin test is safe and generally satisfactory; the eye test is hardly justifiable. Various dilutions of different pollen extracts should be tried in this test. The intradermal test is often the one preferred, and is perhaps the safest when accurately done. The arm is generally employed for this purpose. Several scratches through the epidermis are made, and a drop of the pollen extract, beginning with a well diluted solution, of first one hay fever weed and then another, is used to note the sensitivity. A patient sensitive to an extract soon shows local irritations at the point of absorption. As soon as the pollen that causes reaction is found (the reaction occurring in from five to fifteen minutes), various dilutions of this particular pollen may be tested to determine the dosage correct for this particular patient. The first dose of injection should be that one which fails to excite a skin reaction. The first dose injection should not be given until all symptoms of the local skin test reaction have subsided. After each test, subcutaneous or otherwise, of a pollen or protein extract, the patient should be observed for at least an hour, and if any unpleasant symptoms occur, epinephrine should be immediately administered.

If it is not feasible to test out the individual pollens as described, the stock preparations of mixed spring or fall pollens may be used. Full directions for the use of these pollen extracts for diagnostic purposes, for immunization, and for curative purposes, or

come with the package.

The preventive treatment of hay fever should be begun about eight weeks or more prior to the season in which the patient is susceptible. Ordinarily from ten to fifty injections are required, and they should be given at two or three day intervals, depending on the amount of reaction. If symptoms of anaphylaxis or of hay fever occur, the dose should be smaller and less frequent. If the patient, from such injections, is immune for that year, he may be immune to the hay fever pollen the following year; but it seems to have been shown that this immunity is rather weak and ineffective by the third year. Patients rarely lose their sensitiveness after one season's treatment, and for this reason it is advisable that it be continued for at least three seasons. However, sufficient statistics have not yet been offered to show how long an immunity may last; also failure to produce immunity must be expected. The theory of this treatment is that a person sensitive or sensitized to a certain pollen may be desensitized by exhausting from the body cells the specific proteolytic enzymes by the pollen protein injection. W. W. Duke (Am. J. M. Sc., November 1923,

p. 645) maintains that if the correct pollens are used and the treatment is properly and carefully administered, very few fall to have relief partial or complete. More than a third of the patients who have received the treatment at the proper time have mild symptoms of hay fever during the hay fever season; the remainder are free or almost free from symptoms. Those patients who have slight symptoms in spite of the injections may be partially or completely relieved by intranasal treatment with the pollen. Duke insists that these treatments are so successful that a bad result suggests

an error in diagnosis of the cause.

Harry Beckman (J. A. M. A., Nov. 22, 1930, p. 1582) compares the results in 237 cases treated by inducing aedosis with those obtained by desensitization. With a dol treatment, 67 per cent of the patients obtained marked or complete relief while 70 per cent obtained marked or complete relief while 70 per cent obtained marked or complete relief while 70 per cent obtained marked or complete relief from desensitization. Beckman advises the use of the following for hay

Gm, or Cc.

The effect of viosterol of high potency has been studied in 6 seasonal hay fever patients by B. Z. Rappaport and C. I. Reed (J. A. M. A., July 8, 1933, p. 105). All of these patients were well protected during the 1932 season as compared to symptoms during previous seasons. One was relieved aimost entirely. Large doses of viosterol raised the calcium to very high levels, lowered the potassium level, diminishing its wide fluctuations, and stabilized the potassium relatively low level.

Patients with hay fever were also put into a room equipped with an air-conditioner by Leslie N. Gay (J. A. M. A., May 6, 1933, p. 1382.) The apparatus not only cooled the atmosphere but cleaned it of dust and pollen grains. Complete relief was given to patients suffering from symptoms of hay fever, whether they occupied the room for several hours or for longer periods of time. The relief of the patients apparently depends not only on the cooling of the atmosphere but also and chiefly on the fact that the atmosphere is cleaned of the offending agents.

Tell Nelson et al. (J. A. M. A., May 6, 1933, p. 1385)

state that experimental and commercial filters as now manufactured are not 100 per cent efficient for removal of pollen. However, air filtration that removes all but traces of pollen will relieve symptoms of hay fever. Symptoms reappear on exposure to pollen laden air regardless of length of confinement to filtered air. The time for reappearance of symptoms is inversely proportional to the pollen concentration outdoors. Filtered air, cooled from 8 to 10 degrees F. below outside temperatures without delumidification, does not give as prompt or as great relief from symptoms of hay fever as uncooled filtered air.

Curative.—Not enough data have been presented to show the value of the vaccine and pollen treatment during the active process of hay fever.

It would be inadvisable, however successful in individual cases the pollen treatment might prove to be, to omit the therapeutic suggestions already mentioned. It would also be inadvisable to depend on possible immunization for the following year by means of pollen extracts and to omit a careful study of the patient to eliminate, if possible, all predisposing causes of hay fever disturbances.

# DISEASES OF THE GASTRO-INTESTINAL TRACT

Rules of Hygiens of the Mouth and Treth, 440— Infections of the Mouth, 341—Pyorrhea Alvedairs, 345—General Care of the Mouth and Text 347— Interpretation of Symptoms Referable to, 165 Hyperacidity, 700—Simple Catarrhal Jaumica, 141—Pyoracidity, 700—Simple Catarrhal Jaumica, —Intestinal Stasis—Constipation, 376—Spassic Contipation, 339—Hotokworn Disease, 382—Tapeworm, 387—Ascaris Lumbricoides: Roundworm, 392—Oxyuris Vermicularis; Pinworm, 302.

# RULES OF HYGIENE OF THE MOUTH AND TEETH

In the care of the mouth and teeth the following procedures are recommended:

- Water should be given following the feeding of milk to bottle-fed babies.
- A soft cloth should be thoroughly moistened with a mild alkaline wash and frequently applied over the first teeth of the infant.
- 3. No candy, or at least but little, should be given to young children, and as soon as their teeth have erupted they should have the more crunchy or granular cereals, and not so much of the soft, gelatinous cereals.
- 4. The teeth of young children should be examined by a dentist regularly at least once in six months.
- 5. All cavities, even small, should be filled, at least with temporary filling, thus preserving the first teeth as long as possible so that the jaws may develop properly and the second teeth need not be crowded.

6. The teeth of children and adults should be thoroughly cleaned at least twice a day—better, three times—with a tooth powder or paste that is not too soapy, at least in the morning, and with an alkaline mouth

wash or with milk of magnesia at night. The tooth brush used must be kept clean.

7. All persons, growing children or adults, should have all the tartar that may become denosited cleaned from their teeth once in three months. Examinations of the teeth once in every six months will disclose small cavities before they have become large ones.

8. If the teeth tend to degenerate and cavities form quickly, the trouble is generally with the nutrition, which is often deficient in bone-forming salts or in vitamins. Such patients should receive lime salts.

phosphates and iron, as well as cod liver oil,

The best iron preparations for this purpose are: tinctura ferri chloridi, 1 or 2 drops in a wineglass of water or fresh lemonade, three times a day, after meals; ferrum reductum 0.05 Gm. (1 grain), in capsule, three times a day, after meals; ferri oxidum saccharatum tablets, each 3 grains (0.2 Gm.), one three times a day, after meals,

Edward Mellanby (J. A. M. A., Jan. 31, 1931, p. 324) believes that it is possible to get complete control of dental caries by diet alone, both by producing perfect teeth and, even when the teeth are badly formed, by inhibiting the destructive action of bacteria on the teeth. Diets containing the most milk, eggs and cod

liver oil have the greatest calcifying action.

If the child does not grow well generally, even if he is not a cretin or in any way like a cretin, small doses of thyroid extract (thyroideum siccum) (0.015 or 0.03 Gm.; 1/4 or 1/2 grain) once a day are of value,

and this dose is sufficient. Iodine, too, may be needed. 9. The care of the mouth during severe illness

should be along the lines previously described.

10. The proper care of the teeth will help prevent pyorrhea, and infection, which is a menace to health,

11. The treatment of pyorrhea alveolaris must be strenuous and persistent. It can usually be eradicated by the patient and his dentist. The treatment is persistent cleanliness and antisensis.

# INFECTIONS OF THE MOUTH

Only of late years has the part played by the mouth and its adjacent structures in the production of a great many pathologic processes been demonstrated. The mouth, including the teeth, gums and tonsils, affords a broad surface and readily accessible means of entry for various pathogenic micro-organisms. There may be no visible evidence in the mouth of the focus producing a systemic infection. The focus may be discovered only by careful examination with the roentgen ray, A portal of entry may be present and not directly demonstrable in any way; for example, when the bacteria enter the lymph or blood stream by way of the tonsils. That a focus does exist in the mouth and that it is directly responsible for the pathologic condition has been repeatedly proved by removing the source of infection or by treatment with a proper autogenous vaccine made from bacteria isolated from the pus at the site of the focus. Such treatment often causes the disappearance of the systemic pathologic condition.

Within the mouth there are various channels through which bacteria may enter the system, such as the tonsils, gums and roots of the teeth, and by way of the esophagus to the stomach and intestine. That the tonsils play an important part in various infections has

been demonstrated.

Perhaps equally common as a source of infection are the teeth. The open, exposed, ulcerated or decayed tooth is not always the worst in this respect. More harm may be done by the heavily crowned, capped and bridged teeth, under the poorly fitted margins of which the bacteria flourish and manage either to enter the lymphatics or to send their toxins into the system. There may also be a tiny abscess situated deep down at the root of the tooth. In these cases local manifestations of a focus in the teeth may be entirely lacking, and may be demonstrable only by the roentgen ray. These so-called blind abscesses may remain dormant a long time. Ultimately they may open into the mouth by way of a sinus. Often they lead into larger abscesses in the bone, in which toxins are produced, giving rise to septic conditions. Depending on the nature of the organism in the abscess, there may result any of the complications so often resulting from tonsillar disturbances. Rosenow finds that these foci are common in patients who for years have suffered from arthritis, neuritis, appendicitis, ulcer of the stomach or goiter, and that persons with perfect health are, as a rule, free from sources of infection in relation to the teeth. There is no question but that infection from diseased tonsils and from diseased teeth can cause endocarditis. Hence neglect of such infection is serious

The treatment of the complications secondary to the focus within the mouth consists first of all in removing the mouth infection. Careful examination should be made of the tonsils and teeth, and if the tonsils are found diseased, they should be removed. Often an abscess may be located deep in one of the crypts. If any visible pus is present, it would be advisable to obtain a culture of the bacteria contained in it. Normal tonsils should not be removed. When the tonsils appear normal, even though there may be no history of tooth involvement, the teeth, nevertheless, should be carefully examined. Poorly fitting crowns should be taken off, and often underneath them may be found the cause of the trouble. Every dead tooth is a menace. Even when the cavity can be perfectly filled, a dead tooth has been shown to carry germs within a few months after it has been devitalized In other words, there is no such thing as a healthy dead tooth. A tooth may die from injury, from decay, or from metal fillings. Roentgenograms disclose abscesses and separated dental membranes and eroded roots, but they cannot show that a tooth is dead or that its canals do not harbor dangerous bacteria. Many times a dead tooth with a distinct pus sac at the end of a root is less of a menace to the carrier on account of nature's protecting membranes than is a dead tooth without such an evident infection, as absorption into the lymphatics and blood vessels can occur with greater ease. Many cases of arthritis are cured by a correction of the dental work of the mouth. Roentgenograms may locate a blind or apical abscess when such a condition is least suspected. When an abscess has been found, the tooth should usually be extracted. Occasionally, it is possible to drill into the abscess and in this way offer drainage for the pus. In this way also the tooth may be saved. Impacted, unerupted teeth are also a frequent source of infection. In eradicating diseased teeth, it is a fallacy for the dentist to remove what are termed "the worst teeth." No one can determine without bacteriologic tests which diseased or dead tooth is the most or the least dangerous. The only safe procedure is to eradicate all removable sources of harmful germ growth.

Besides the removal of foci of infection, the use of a mouth wash may be indicated. There are many mouth washes on the market under various trade names. Many of these contain the same ingredients and vary but slightly in their composition from those described in either the Pharmacopeia or the National Formulary. The best mouth washes are those that are alkaline, antiseptic and astringent. Some of the simpler antiseptic and ratingent. Some of the simpler antiseptic and stringent mouth washes are strong solutions of glycerin or of alcohol. Hydrogen peroxide solution, one part to three parts of water, is a good wash. For ordinary cleansing purposes, sodium bicarbonate or milk of magnesia, in water, will serve the purpose,

Cleanliness of the teeth plays an important part in the asepsis of the mouth. By regular and frequent cleaning of the teeth, the accumulation of tartar on and between the teeth may be to some extent prevented. A mouth wash will aid in cleansing the mouth. Equally if not more important in the care of the teeth is the periodic visit two or three times a year to a dentist, that tartar may be removed, that caries of the teeth may be treated early, and that the condition of the gums may be moted and ous pockets discovered.

### PREVENTION

Prevention of suppuration or other infection in the mouth is of the greatest importance all through life. The following suggestions for preventive measures may be of value:

- There should be inspection of children's teeth in schools.
- Every infected area in the mouth must be treated and eradicated, if possible, as soon as discovered.
- The public should be taught that a bad tooth or a diseased gum or tonsil is serious, and neglect of such a condition may cause an incurable disease.
- The mouth of every patient should be examined as part of the physical examination.

- Roentgenograms of suspected gums or jaws should be taken, and if advisable, a culture from the pus or secretions of the infected region should be made.
- 6. There should be cooperation of the physician with the dentist to decide on what is best for the correction of mouth defects, whether certain teeth should be filled or pulled, or otherwise treated, and just what is the best treatment for a diseased gum or tonsil. Neither physician nor dentist is infallible, and both should recognize that cooperation is best for the patient.

# PYORRHEA ALVEOLARIS

# GENERAL CONSIDERATIONS

Pyorrhea alveolaris is prevalent in spite of the careful use of the toothbrush. When there are canker sore or ulcers or pyorrhea, a toothbrush used over these parts must necessarily become contaminated and is likely to infect healthy parts of the mouth. It is self-evident that when pyorrheal gums are treated in a dental office, the person should be warned against again using his contaminated toothbrush.

By pyorrhea alveolaris is meant a condition in which pus is present at the gingival margins affecting the peridental membrane and ultimately exposing the bone. As a result, pus pockets, from which pus escapes freely or may be easily expressed, occur. Predisposing factors are bad crowns, careless fillings, improper bridging, and, in all classes, neglect of dental Bacteria find a lodging place in the tartar deposited on the teeth or under a cap, and set up an inflammation. The gums become painful and tender. and there is a tendency to bleed easily from the slightest touch. Gradually the gums recede until pockets form between the teeth and gums in which the bacteria grow and thrive unchecked. Unless the disease is stopped, the teeth lose their firm support in the alveolar processes and become loose.

Pyorrhea alveolaris seems directly responsible for a large number of body ailments produced by the entry into the lymph or blood stream of the bacteria or their toxins from the infected gums. It is also true that general systemic infections, by lowering the resistance of the gums, may be the starting point of pyorrhea alweolaris, which will continue after the general infection has been cured. Removal of the pus may cure the associated condition. It is also probable that the pyorrhea, through its micro-organisms and their toxins, reduces the physical resistance of the body to such an extent that it is readily susceptible to other invasions.

There has been considerable difference of opinion as to the cause of pyorrhea alveolaris. Fully 150 different organisms have been isolated from the gums.

Vaccine treatment is not often satisfactory.

#### TREATMENT

The employment of iodine on the gums is both antiseptic and stimulating to the tissue of the gums, which becomes firmer under its use, but rarely should it be used in strong solutions, lest blistering result and more infection occur. Talkot describes his use of iodine as follows: A mixture which he calls iodoglycerol, consisting of zinc iodide, 15, water, 10, iodine, 25, and glycerin, 50, is applied with cotton wound around wooden applicators to the gum margins above and below. The lips and cheeks are held away from the jaws until the jodine has dried. These applications should be made every day and continued until the patient is dismissed. Several other germicides may be used in the mouth in the treatment of pyorrhea. Most important are mercurochrome-220 soluble, methylene blue, hydrogen peroxide and camphor solutions, In using solutions of hydrogen peroxide the dentist and physician must remember that while it is a most valuable germicide, it tends to burrow at the end of the pus pockets and sinuses and may dissect tissues by the bubbles that are formed. Therefore it may not be advisable to use this most valuable antiseptic frequently.

Before deciding that the diseased gums are due to an ordinary pyorrhea, and not infected with Vincent's bacteria, the dentist should take a culture and have it examined in a bacteriologic laboratory. "Trench mouth" is very much on the increase, and the disease is now being found not only in the careless, but in well-to-do and clean families. It is very contagious. In eradicating this disease, the dentist and physician must remember that the tonsils may also be affected.

Sodium perborate has an almost specific action in con-

trolling Vincent's angina.

Most important in ridding the patient of pyorrhea are the services of a good dentist. Whatever the local or systemic treatment, the dental management of the retracted gums and eroded and diseased teeth is of primary importance and any treatment will fail unless the dental care is also successful. Massage of the gums two or three times a day is essential for success.

But let it be again emphasized: The importance of adequate dental assistance in the treatment of

pyorrhea cannot be overestimated.

# GENERAL CARE OF THE MOUTH AND TEETH

FOUL BREATH

It is rarely excusable for a person having once discovered that the breath is offensive to neglect prevention of the odor. Perhaps the most frequent cause pertains to the teeth. There may be cavities, or there may simply be lack of cleanliness of the mouth. It is necessary to remove with a toothpick or dental floss particles of food which may have become fixed between closely set teeth. All cavities should be filled and tartar deposits should be regularly removed, not only because of their tendency to cause disagreeable odor to the breath, but because of the possibility of allowing germs to develop and be swallowed. If the stomach is not in a healthy condition and the gastric juice not normal, such germs may not be killed. The teeth must be kept clean, and the cleansing must be done at least twice a day-in the morning and at bedtime. The proper tooth powder or paste should be determined by the ease with which the teeth are cleaned, some requiring more friction, and others requiring more soap. The choice of the powder or paste and the frequency with which the teeth should be brushed are determined by the results.

If there is any tendency to alveolitis, or if purulent alveolitis is present, then antiseptic, followed by alkaline, mouth washes should be used frequently until the condition is cured. If it tends to recur, then such mouth washes should be used once a day, continuously, For a time weak hydrogen peroxide solutions are

beneficial, especially if the acid, which is formed after its oxidizing action, is quickly washed away with an alkaline solution. If the gums are spongy a 5 per cent solution of potassium chlorate makes an efficient mouth wash. One of the best local astringents and local antiseptics is a dilute solution (perhaps one part to five) of alcohol in water. There are many good antiseptic solutions accepted by the Council on Pharmacy and Chemistry and listed in New and Nonofficial Remedies.

If the teeth are not the cause of the odor of the breath, the tonsils should be examined, and not infrequently little calcareous deposits will be found in one or more crypts, or there may be a pocket of caseous deposit back of the tonsil. These, of course, should be removed, the crypts treated with some antiseptic solution and a cleansing antiseptic gargle given. If the infected tonsil can not be readily cleaned and does not remain healthy, it should be removed. Also, it is probably rare that, one tonsil being infected, the other

is healthy.

Another frequent cause of bad breath is postnasal or nasopharyngeal infection. If this is a chronic condition the treatment is tedious, and unless the patient thoroughly cooperates, results will be unsatisfactory. The proper treatment of nasal and nasopharyngeal infection can be determined only by a study of the individual condition. A warm cleansing solution is, of course, always important, and the frequency of its use can be determined only by the rapidity with which the secretion forms deposits.

In atrophic rhinitis the odor is terrible, and unfortunately, the condition is generally incurable; but there is absolutely no excuse for a patient with this disease polluting the atmosphere of the rooms in which he works or lives. The odor can be prevented by the proper use of mild antiseptic and cleansing solutions. such as Dobell's solution. This solution is prepared as

follows:

В,	Phenolis			m. xv	
	Sodii bicarbonatis				
	Sodii boratis		aa	gr. xlv	
	Glycerini			fl3 iiss	
	Aquaead	200	ad	fl3 vii	

Cm or Ca

M. Sig.: Use as an antiseptic gargle or as a nasal antiseptic spray.

Various other antiseptic solutions may be used.

Other causes of disagreeable breath are constipation and dyspensia. The cause of these conditions should

be treated, and as the tongue becomes clean and the pharvnx less congested the breath will improve.

Laryngeal and bronchial inflammations and catarrhs are other causes of bad breath. If the condition is acute or subacute, it can soon be improved by proper treatment. If the condition is a chronic one, mild antiseptic inhalations will largely prevent the fetid condition.

Gm. or Cc.

B Creosoti 1 m. xviii
Olei pini silvestris 10 or fi3 iii
Tincturae benzoini ... q. s. ad 100 ad fi5 iv

M. Sig.: To inhale a teaspoonful from boiling water two or three times a day.

# TOOTH POWDERS AND OTHER DENTIFRICES

Although there are numerous tooth powders and dentifries available, and although individual and varied claims are made for each, it is doubtful whether much in the way of antisepsis or bactericidal effect in the mouth can be proved for any of them. It must be remembered that the action is evanescent and that the moment the use of the preparation is stopped the first breath or mouthful of food may bring in a host of new bacteria. However, such preparations have excellent mechanical cleansing effects and may well be utilized for the purpose.

# MOUTH WASHES AND GARGLES

There are perhaps fifty mouth washes on the market. They are all similar in their composition, more or less multiple in their constituency, and more or less expensive. A number of pharmacopeial and National Formulary preparations have been developed to meet the need for mouth washes.

Such polypharmacy as this is absolute nonsense. Like many pharmaceutic preparations, the value of the really useful ingredients is obscured by the useless camouflage which surrounds them.

When a strong antiseptic is used, after it has acted for a few minutes, soothing washes or sprays should be used. Also it should be remembered that any simple cleansing wash (than which perhaps nothing is better than simple salt solution in so-called physiologic strength, 0.9 per cent, or one-fourth teaspoonful of salt to about half a glass of warm water to which may or may not be added another one-fourth teaspoonful of softum bicarbonate) benefits an inflamed mucous membrane. After such cleansing of the membrane, the anti-septic may be directly applied, if such is indicated, or the cleansing and soothing gargle or mouth wash just mentioned may be all that is needed. It is not the particular preparation that is used, or the particular preparation that is used, or the particular ingredients in the mouth washes and gargles, but it is efficient washing and garglein that is of benefit.

Perhaps the most pleasing pungent taste to the majority of patients is peppermint, and there is no reason for mixing this up with several other aromatics. If peppermint is disagreeable to a particular

person, wintergreen may be substituted.

The following are formulas of a few simple solutions for mouth and throat washes:

M. Sig.: Use as a gargle or mouth wash, diluted or undiluted, as directed.

Gm. or Cc.

M. Sig.: Use as a gargle or mouth wash, diluted or undiluted as directed.

M. Sig.: Use as a gargle or mouth wash, diluted or undiluted, as directed.

The value of dilute alcohol washes, such as one part of alcohol to four or five parts of water, should not be forgotter. Alcohol is astringent, cleansing and antiseptic. Sometimes potassium chlorate solutions, though very disagreeable, are most healing when the whole mucous membrane of the mouth is inflamed.

If there are no pockets in which hydrogen peroxide may form bubbles and cause an extension of ulceration, there is no mouth wash more autiseptic and more efficient than diluted hydrogen peroxide, as one part of hydrogen peroxide solution to three or four parts of warm water. Immediately after the use of hydrogen peroxide solutions, a a mild alkaline solution should be used to wash off the froth caused by the peroxide action and also to remove the acid irritation caused by such action.

If the mouth is dry during illness, some slightly pungent substance may be taken, to be either chewed or swallowed, such as some effer rescing were, ginged ale, some pungent mint chewing-gum, or ever a finish peppermint lozenge. Of course the value, is much conditions, of fruit sours such as lemonade, orangeade or a piece of orange is well understood. These will increase the mouth secretions and prevent drying of the mucous membrane, which is such a frequent cause of ulceration.

Various preparations of glycerin diluted with water, with or without boric acid or borax, or boroglycerin, or milk of magnesia, are all valuable in preventing or

aiding in the healing of a sore mouth.

If the tincture of iodine does not heal an ulcer or issure, one or two applications of either the stick silver nitrate or a 25 per cent solution, applied by means of a swab, will generally cause healing.

If the patient is too ill for strenuous or perfect cleanliness of the mouth, as soon as convalescence is established extra care should be given the mouth and

teeth.

It should not be considered that a patient has been thoroughly examined until the condition of the mouth has been investigated. As stated before, too many chronic diseases have their source and continuation from diseases of the gums or from neglected, decayed and dead teeth, to say nothing of diseased tonsils. A fetid, bad breath should always be investigated, as it is generally due to chronic inflammation in the mouth. While most adults over 40 years readily acquire pyor-thea alveolaris, proper care will prevent the condition, and by various methods many patients are cured of what was long considered an incurable condition.

### CARE OF THE TEETH IN SICKNESS

It has too long been believed that illness of itself causes degeneration of the teeth, either cavitation or actual loss. While there are many elements of nutrition that are needed for the teeth to remain healthy, neglect of the mouth and teeth is probably the largest factor in their degeneration. Tartar forms, inflammation begins and pus pockets develop around the teeth when they are not properly cleansed and treated.

During every severe illness not only should the mouth be properly cleansed, but the teeth should be carefully cleaned by the nurse with cotton swabs or with pledgets of gauze, used with or without a tooth powder or tooth paste or with some cleansing solution. A great source of cleanliness for the teeth is chewing, which is more or less in abeyance during serious sickness, but we are learning that in most of the prolonged acute diseases the patient is able and willing to chew such a simple thing as dry toast. This alone cleanses the teeth. starts the flow of saliva and mucus and frequently offers a better food than the constant swallowing of even nutritious liquids. If the ordinary simple cleansing lotions are not sufficient to prevent the formation of pus or ulcerations, various applications to the regions of trouble should be made. Perhaps none is better than a modified solution of iodine as follows:

Gies found that so-called antiseptic mouth washes and alkaline washes did not wash off or dissolve the adherent mucin, and therefore are not effective in preventing decay of the teeth. He believes that the vegetable acids, such as diluted vinegar and the fruit juices and their acids, are the most successful cleansing substances that can be used on the teeth. He also believes that starches and sugars should never be caten alone, but should be followed by some acid substance, as some of the acid fruits or some of the vegetable sours. After most meals, therefore, it is

good sense to eat a little fruit, and on going to bed perhaps the most successful cleanser of the teeth is a little

sour fruit or diluted fruit vinegar.

Children and patients should also be taught to clean the gums as well as the teeth, and when it is needed a patient should be taught to massage the gums. The use of good wooden toothpicks or dental floss to remove particles between the teeth should be approved. Many patients' teeth are so close together that particles of food remain lodged between them and cannot be removed in any other way. Dental floss should be carefully used occasionally, or frequently, if possible. If inflammation actually occurs in the gums or around a tooth, the advice and care of a dentist are needed

# CARE OF TEETH IN PREGNANCY

During pregnancy there is an insufficiency of calcium and phosphorus in the maternal tissues, resulting from the demands of the growing fetus. Likewise during lactation the formation of milk reduces the calcium and phosphorus content of the maternal body. Hence these minerals must be supplied in sufficient quantities during pregnancy and lactation to cope with the demands of the fetus in utero and the nursing baby, If these minerals are not supplied in the food or as medicinal preparations, the mother suffers. Among the chief symptoms and signs of lack of calcium and phosphorus are dental caries, puffiness of the hands and face, tingling and numbness of the fingers and toes, and evidences of tetany such as muscle contractures. which produce severe pain, muscle weakness and exhaustion. The chief foods that contain calcium are milk, vegetables and prepared cereals. Eggs contain large amounts of phosphorus.

It is not only necessary to have abundant calcium in the diet but it is essential that the body be able to absorb and utilize this mineral. Absorption depends on the presence of ergosterol, which is normally present in the skin and which acts only in the presence of natural or artificial sunlight. Activated ergosterol (viosterol) helps in the absorption of calcium from the gastro-intestinal tract and in deposition of the calcium in the bones. The utilization of calcium by the body is dependent on the proper functioning of the parathyroid glands. From the foregoing it is apparent that a pregnant woman should include in her diet throughout pregnancy an abundance of milk, eggs. vegetables, fruits, butter, whole grain cereals and cod liver oil, haliver oil or viosterol. If the patient cannot drink three or four glasses of milk a day, calcium and phosphorus should be prescribed in tablet form. During the summer months the sunshine aids in the utilization of the calcium in the diet but in the winter months, in climates where sunshine is at a minimum. it is most important that a pregnant woman take viosterol or haliver oil every day. These preparations and a proper diet help the mother's teeth and also the teeth of the unborn child. The simplest way in which to administer viosterol is to prescribe capsules containing 3 minims of halibut liver oil with viosterol 250 D These capsules, which have in them both vitamins A and D, are taken three times a day during the days with little sunshine and twice a day at other times. Calcium, phosphorus and vitamins even when given in fairly large amounts do not have any deleterious effects on the mother or baby. In addition to protecting the mother's teeth by diet and medication, it is important that a pregnant woman see a dentist at least twice during her pregnancy both for the purpose of having the teeth properly cleaned and for the detection of early caries, cavities or brittleness.

Any advice given as to the diet of the expectant mother should be applied to the individual with discretion and should be definitely related to all the specific problems in the management of the case. In general the diet calculated to provide liberally for the bone needs of the growing child is also the best for adequate tooth development in the child and the prevention of decay in the mother. Mineral-containing foods, such as milk and milk products, should be used liberally. It is extremely difficult to supply enough calcium and phosphorus in any other way. Adequate, even generous, allowance should be made for vitamins, especially D. The energy-supplying foods, especially carbohydrates, should be reduced nearly to the minimum. It is most important to consult one's dentist during preg-

nancy for early diagnosis of tooth decay and prompt filling of the cavities while they are small. There are no specific indications for any form of medical treatment during this period and there is no reason to believe that the ingestion of calcium, phosphorus and vitamins within the foregoing limit can harm the mother or child. Such a program may have some effect in insuring the child against future dental caries, although it is of relatively little significance as compared with factors that are brought to bear on the child after birth and probably to a less degree with those that have to do with the hereditary background. High individual immunity to dental decay is probably no different in origin than the same kind of immunity to exhar fishers.

## INTERPRETATION OF SYMPTOMS REFER-ABLE TO THE STOMACH

There is perhaps no group of symptoms regarding which there is more misapprehension among physicians than symptoms arising from the stomach or felt in the region of the stomach.

#### INDIGESTION

Indigestion is a much abused term commonly used to cover all forms of stomach disease, Strictly it means the nondigestion of food. This is a rare event among those who are not seriously ill. That digestion may fail in the stomach or in some other part of the alimentary canal or that some parts of the food may escape digestion is common enough. But the human organism is provided with compensating mechanisms. If one organ in the digestive system fails to perform its duty another is usually capable of taking its place. As a rule, in adults, even in the case of those who complain of trouble with the stomach or bowels, only a minimum of the food ingested escapes direction or fails to be absorbed. The test of digestion is found in the state of the bowels; if the bowels act normally, or are constipated, as a rule the digestion is complete and may indeed be too good. If there is diarrhea it may be assumed that digestion is imperfect. although there may not be any lesion of the stomach or intestines. Digestive ferments are not often lacking, and there is rarely a rational indication for prescribing artificial ferments to supply a lack in the normal action of these organs, except dilute hydrochloric acid.

# THE IMPORTANCE OF GASTRIC DIGESTION

It is not desirable to overrate the importance of the processes going on in the stomach in the final action of digestion. The stomach is a preparatory digestive organ. It is a reservoir which reduces the food to a fine state of subdivision and renders it suitable for the subsequent action of the secretions of the liver, pancreas and intestines. Its work is seldom complete. The organ may fail to perform its functions for a time without any serious disturbance in nutrition. Sooner or later, however, changes in the utilization of food occur in the absence of the correct functions of the stomach, which more or less seriously affect metabolism and nutrition. In this connection we may note some peculiarities of the motor action of the stomach which have an important bearing on treatment. The stomach does not absorb water and hence in case a liquid which needs no digestion is taken, even at meal time, a special channel is formed along the lesser curvature by which the liquid is conveyed to the intestine without mingling with more solid undigested contents of the stomach. Liquids taken at meal time do not, therefore, dilute the gastric juice as was formerly taught. Such an event may happen, however, when the stomach is atonic and allows water or other liquid to flow into the lower part instead of into the intestine in a normal manner

# RELATION OF THE STOMACH TO OTHER ORGANS

The stomach has important nervous connections with other organs by which it reflects functions occurring in other parts of the digestive system. Symptoms apparently arising in the stomach may, in reality, depend on disease of the liver, gallbladder, appendix, or lower bowel. Neighboring organs not connected with the process of digestion or even remote organs may produce a reflex disturbance in the stomach. A very large part of the disturbances of the stomach A very large part of the disturbances of the stomach is of psychic foreign. Everstain is a frequent cause of

indigestion. The headache from eyestrain is often accompanied by nausea and vomiting, leading the patient to consider that the whole disturbance is due to "a bilious attack," and often misleading the physician, who directs a change of diet and a treatment for the stomach condition without having the eyes examined for defects. Such cases of stomach disturbance are entirely cured by correct glasses, perfectly adjusted and properly used, Glasses that do not correct the optic defect, are maladjusted, and are not used constantly when there is astigmatism and when they get out of adjustment will allow the stomach symptoms to recur. The physician should always interpret the symptoms presented by the patient who thinks that there is something wrong with his stomach in the light of possible disease of other organs or of mental disturbances. Even in the presence of proved organic disease, the possible influence of emotion in producing symptoms should not be forgotten.

# THE MAJORITY OF GASTRIC CASES FUNCTIONAL

While the existence of serious organic disease should never be overlooked, it is well to understand that only a small proportion of patients who come to the physician complaining of the stomach or of digestive disturbances have uleer or cancer. The physician should not make or suggest a diagnosis of serious disease until he has proved its existence by appropriate physical and laboratory examinations.

# SYMPTOMS NOT CHARACTERISTIC

Diagnosis on the basis of the patient's recital of symptoms without physical examination or the analysis of a test meal or of the feces is much too common. It may be said at the outset that there exist scarcely a symptom that is characteristic of any definite stomach disease. This may explain the readiness with which practitioners resort to such terms as indigestion, dyspepsia, catarrh of the stomach or the indefinite term "stomach trouble" as a diagnosis.

THE RARITY OF FERMENTATION IN THE STOMACH
Formerly it was a favorite custom to explain the
belching of gas from the stomach and the flatulent
distention of the organ, and also the "sour" stomach.

by saying that these symptoms arose from the fermentation of the food. Such an explanation gave rise to attempts to suppress fermentation by giving a host of antiseptics, some of powerful and some of feeble germicidal power. This explanation and the practice based on it arose from the application of a chemical theory without sufficient regard for the actual conditions prevailing in the stomach. The contents of the stomach are at times subject to fermentation with the production of a certain amount of gas. Lactic acid may be formed by fermentation, but usually no gas is formed with it: butyric acid may occur in the stomach contents and its formation is accompanied by the evolution of some gas: yeast fermentation forms gas at times. However, if one will watch one of these fermenting liquids one will find that ordinarily the formation of gas is slow and quite insufficient to account for the belching that many patients experience. These occasional sources of gas account for its accumulation only in rare cases. In the majority of cases the gas present in the stomach consists of swallowed air. Air swallowing is a frequent cause for symptoms. It occurs normally as a physiologic act. Functional nervous belching occurs in neurotic individuals as a purposeful exaggeration of the normal.

The treatment consists in explanation to the patient of the true cause of his symptoms, the giving of mild nerve sedatives such as the bromides or phenobarbital, atropine, olive oil at the beginning of meals and carminatives. As a rule, even in cases in which much distress is produced by flatulence or belching, there is no fermentation in the stomach. The acid present in the stomach contents is seldom the result of fermentation but is produced by oversecretion of the gastric juice. It is essential, therefore, to ascertain the true origin of these symptoms before attempting to prevent them by the administration of injurious anti-sectics.

The treatment of ordinary gastric indigestion, when all reflex causes have been studied, and if possible eliminated, consists primarily of ordering the proper diet. Generally the starches should be reduced, and hot breads, too much cereal, too much sugar and sweets, and fried foods should be prohibited. Oatmea, lunkes

in the form of a gruel, is a frequent cause of stomach and intestinal indigestion. Gas-producing foods, especially sweet potatoes, cabbage, turnips, onions, spices and rich condiments, should be prohibited. The person should be told to eat slowly, and it should be ascertained that he has proper teeth with which to chew. If the tongue is much coated, it is frequently an evidence that the hydrochloric acid content is deficient, and a small dose. 5 drops of the dilute hydrochloric acid in water. three times a day, after meals, should be ordered. If there is much loss of appetite and if there is some epigastric soreness, with waves of nausea after eating, even if there is no vomiting, the mucous membrane of the stomach is probably irritated; in other words, there is a subacute gastritis, and in this condition hismuth subcarbonate combined with sodium bicarbonate (1 Gm. or 15 grains, of the former and 0.50 Gm., or 71/2 grains, of the latter) taken three times a day, best about an hour before meals, is efficient treatment. If it is suspected that there may be a small ulcer or canker in the stomach, which probably occurs much more frequently than is ever diagnosed, 2 Gm. (30 grains) of bismuth subcarbonate taken in one dose before breakfast, preceded by a glass of hot water, and a carefully modified diet which does not contain any irritants are generally very successful in curing these mild stomach disturbances. For perfect digestion, the patient should be told that he must not eat when too tired or overheated. Ice water taken with meals is inadvisable. It is hardly necessary to urge that all mouth infection should be eliminated, if the treatment of indigestion is to be successful

# GASTRIC AND DUODENAL ULCERS

More than a million and a half males and more than half a million females in this country have peptic ulcer; nearly a third of these will have hemorrhages from these ulcers, and approximately 28,500 males and 6,500 females will have a fatal hemorrhage. Brinton pointed out that 40 per cent of ulcers are on the posterior wall of the stomach, 15 per cent at the pyloric extremity, and 25 per cent of the lesser curvature. Only about one-fitth occur on the anterior surface. In 20 per cent

there is more than one ulcer. In the presence of normal acidity, physiologists have shown that digestion of the

stomach lining cannot occur.

Any treatment that gives physiologic rest may tide a patient over an exacerbation of symptoms and is likely to cause temporary healing at least. But, such treatment gives a feeling of security with a very likely outcome of more severe symptoms and the final necessity for surgery. A bleeding uleer must, of course, be operated on, and in chronic uleer of the stomach there is a cancer liability of 5 per cent. About 2 per cent of cases in which operation has been performed will require a second operation.

If in ulcer of the stomach or duodenum symptomatic relief does not occur after two weeks of rest and medi-

cal treatment, the patient should be operated on.

Ulcers occurring in the neighborhood of the pylorus either on the lesser curvature in the pyloric antrum or in the first part of the duodenum, are probably due to similar causes and have the same general character. They may, therefore, properly be considered under the same head. Their causation is to be found probably to some extent in abnormal conditions affecting the nerves. the motor activity of the stomach and duodenum, the character of the food and the acidity of the gastric juice. An acute loss of the mucosa in a healthy stomach is rapidly repaired; an acute ulcer of the stomach usually gets well rapidly. A chronic ulcer behaves differently, indicating that there is some complicating factor to keep it from healing. Much experimental work has been done to show that the nervous supply of the stomach is necessary to maintain a healthy condition of the mucous membrane. Further, the experimental work seems to show that thrombosis of the blood vessels or an "infection" of an area of the mucosa is sufficient to cause the destruction of a portion of the mucosa and institute an ulcer. Ulceration thus produced is favored and the necrotic tissue is digested and carried away by a gastric juice of a high degree of acidity. A definite influence prolonging the existence of such a lesion is the occurrence of pyloric spasm and the retention of the remnants of food and gastric contents containing a large percentage of hydrochloric acid. In such cases the layer of protecting mucus is digested away and the

ulcerated mucous membrane is exposed to long continued action of highly acid and irritating gastric contents.

The process of ulceration in the stomach, in the light of our present knowledge, may involve the following steps: initial weakness or predisposition of the tissue; initial injury in the form of abrasion, thrombosis, or necrosis from infection; removal of necrotic tissue by active gastric juice; recovery in a normal stomach, but in the presence of pyloric spasm or of gastric stasis and the continued action of irritating food or secretions, a continuance of chronic ulceration. In addition anemia may be present as a complicating condition

## SYMPTOMS

The symptoms of gastric ulcer vary, but a certain number have been considered classic and should be kept in mind by the physician as the basis of a diagnosis. At the same time the practitioner should remember that any of these signs may be absent or may fall to present their usual characteristics. The principal symptoms and signs are pain, vomiting, hematemesis, melena, tenderness of the epigastrium, tender points near the spine, hyperchlorhydria, and a filling defect in the pyloric nucosa or duodenal cap, as shown by roentgenographic examination.

Pain in gastric ulcer occurs in attacks with intervals of remission, sometimes of days or longer. The pain comes during the gastric digestion; it may be experienced immediately after taking food, but corresponds to the period of high addity. It is aggravated by coarse foods, but is often relieved by bland foods or alkalis. The pain is referred to the epigastrium but this does not necessarily indicate the exact location of the ulcer.

Vomiting is likely to occur after a meal. It is frequently sudden and projectile, and the presence of blood in the vomited matter is characteristic of the condition.

Hematemesis, or the vomiting of blood, is an important symptom and when the other manifestations are present it may suffice to confirm the diagnosis of gastric ulcer. It must be remembered, however, that blood may be vomited after it is swallowed from pulmonary hemorrhage, or it may be shed into the stomach from the bursting of a branch of one of the radicles of the portal vein or from an esophageal varix. The latter forms of hemorrhage are sometimes the result of such conditions as high blood pressure in the portal circula-

tion produced by hepatic cirrhosis.

The presence of large quantities of blood in the stools may be discovered macroscopically by their dark, tarry character. Such a condition of melena is corroborative of the diagnosis of gastric uleer, but other symptoms should be present to indicate that the stomach is the source of the bleeding before we should give the mere presence of blood in the stools much weight in the diagnosis of that condition. One must always bear in mind that gastric and intestinal cancer may be the cause of both evident and occult blood in the stools.

A tender point in the epigastrium is found in most cases of gastric ulcer. The tenderness is referred to a point about midway between the ensiform cartilage and the umbilicus, the point being constant in one

locality and strictly circumscribed.

Nearly as constant and quite as characteristic are tender points felt sometimes on both sides, sometimes only on the left, in the dorsal region near the spinous processes of the tenth to twelfth vertebra. The disappearance of these tender points during treatment for ulcer is a valuable indication that the patient is

improving.

The diagnosis of gastric or duodenal ulcer may be confirmed by the roentgen ray when observed by repeated pictures fluoroscopically. Test meals afford only corroborative evidence of the existence of an ulcer. Excess of free hydrochloric acid is usually present. Heintz and Welker (Ann. Clin. Med., November 1924, p. 371) note that "most of the investigators of the fractional test meal agree that the acidity curves may run from anacidity all the way through to hyperacidity in both health and disease. Our results on proven cases confirm these observations so far as ulcers of the stomach or duodenum are concerned. We conclude, therefore, that in ulcer the diagnostic value of the curves is slight."

Gastric cancer may not cause absence of hydrochloric acid. On the other hand, pernicious anemia is almost invariably associated with a greatly decreased amount, if not absence, of hydrochloric acid. There is frequently evidence of delay in the evacuation of the stomach contents, and blood, either macroscopic or occult, is present in the stools, in the majority of cases of pernicious anemia. The presence of occult blood in the stomach contents is not pathogenomic of ulcer. Macroscopic bleeding may be due to injury of the mucosa by the stomach tube. The roentgenographic data are gradually assuming increasing importance, and while they should not be considered pathognomonic of ulcer, they may be considered almost positive when the other conditions mentioned are also present.

Occult blood in the feces is of more importance. If not constantly found, it is a strong indication of ulcer, presumably in the neighborhood of the pylorus.

In arriving at a diagnosis of the source of stomach symptoms, one should remember that a most frequent cause of gastric disorders is a pathologic condition of the gallbladder, either gallstones or cholecystitis. The next most frequent cause of these symptoms is chronic appendicitis. Also, most any disturbance in the abdomen or in the pelvis, or even some kidney conditions may cause reflex stomach symptoms. In fact, the diagnosis of an exact condition of abdominal abnormality is one of the most difficult problems in medicine. Gastric reflexes from nervous causes (eyestrain or other reflex causes) have previously been mentioned.

Thyroid insufficiency causes a slowed digestion as well as many other symptoms, including yawning. The gastric secretion is diminished in fever, and especially is the hydrochloric acid lessened. The motility of the stomach is decreased by tobacco in those who are accustomed to its use. It is increased by coffee and strychnine. Atropine may decrease irritability of the pylorus and stop pyloric spasm, but it has not been found to diminish the hydrochloric acid. It may decrease the whole gastric secretion as it does most secretions, and may stop excessive contractions of the stomach. A milk diet may control hypermotility if small amounts are given frequently.

# ULCER OF THE DUODENUM

The principal symptom is pain, usually localized in the region of the pylorus, intermittent in character, occurring about two hours after a meal, and frequently at night. In other words, this pain occurs when the stomach is more or less empty. This pain is more often relieved by eating some bland food or drinking milk than is the pain of uleer of the stomach. The appetite is generally good, and vomiting and other symptoms of gastric indigestion are infrequent. Attacks of diarrhea may occur, and occult blood is often present in the stools. There may be marked hyperchlorhydria.

#### TREATMENT

The treatment of peptic ulcer consists primarily of: (1) absolute rest in bed; (2) the proper diet; (3) the proper medicinal treatment, and (4) operative treatment when the symptoms require it or when medical treatment has failed.

The patient should not get up to urinate or to move his bowels; a bed pan should be used. If the patient is constipated, the rectal injection of a half ounce of glycerin with an equal amount of water is advisable.

One of the chief factors in the continuance of ulcer seems to be the irritating gastric contents which owe their irritating properties largely to their acidity. Hence the first step in the regimen is to reduce the acid secretion by diet and proper treatment.

Not only should the degree of acidity be determined and a search be made for any other condition of the stomach which might cause chronic irritation, but the status of other organs should be interrogated for other possible cause of hyperacidity and proper treatment should be applied. Medicinally the best remedies are

alkalis combined with bismuth.

As hyperacidity seems to increase the ulcration, and certainly increases the pain, and since it is likely to increase the vomiting, anything that diminishes the acidity is good treatment. A diet free from the substances that cause the greatest outpouring of hydrochloric acid is the one to be followed. In other words, a diet without meat and meat broths, without toast and any hard particles of food that can scrape or irritate

the inflamed part should be selected. The Lenhartz diet with raw eggs is considered quite sensible as giving nutrition and at the same time inhibiting the production of hydrochloric acid and tending to heal the ulcer.

The raw eggs are beaten up whole and placed in a cup or glass surrounded by ice. The small amount of milk given is also served iced in the same manner, and the egg and milk feedings alternate with each other every two hours, at first two teaspoonfuls of the egg and four teaspoonfuls of the milk. The first day two eggs and six ounces of milk are used. The eggs and milk are gradually increased from this minimum until by the sixth day seven eggs and twenty-two ounces of milk are given. From the third day on a little granulated sugar is added. At the end of a week the number of eggs is reduced and some scraped beef is allowed. During the second week, the eggs may be soft boiled. Four should be administered a day, with the milk increased to nearly a quart, sugar as before, and scraped beef or chopped chicken. Rice or bread with a little butter may be gradually added to vary the diet. Whatever is taken, if solid, should be very completely and slowly masticated. At first the amounts ingested at one time must be very small and taken at intervals of two hours during the day. The foods for the first week should be cold and the next week only warm, never hot. Small sips of iced water may be taken as often as desired or advisable

In view of the hyperacidity, it is well to add to the diet as much fat as can well be borne, in the form of

butter or cream.

Peptic ulcer is often a self-limited condition with a peculiar periodicity, and many of these remissions are laid to treatment. Most of the distress and pain are due to hypermotility of the stomach rather than to

hyperacidity.

W. C. Álvarez (J. A. M. A., Dec. 18, 1926, p. 2086) says that uleer in this region rarely, if ever, develops into cancer. If such an uleer causes obstruction of the pylorus, operation must, of course, be done. If when several medical treatments have caused improvement and then there are recurrences, operative treatment is a necessity. He sums up by saying that medical treatment in duodenal uleer should be reserved for young

men and women with their first attacks, and for those who can afford to rest a sufficient length of time for a cure to be permanent. Exercise, he finds, is harmful in these cases. He urges the advantage of frequent feedings at two-hour intervals, and outlines his diet.

Samuel I. Fogelson (J. A. M. A., Feb. 28, 1931, p. 673) used gastric mucin prepared from hog's stomach in treating ulcer. Complete relief from symptoms for periods varying from two to five months was afforded to patients with classic histories and roentgen appearances of peptic ulcer by feeding them about an ounce of hog's gastric mucin, three times a day with their meals, in addition to about 30 grains (2 Gm.) of mucin in tablet form hourly throughout the day. The substance is now available in products approved by the Council on Pharmacy and Chemistry. Hundreds of instances have been described in which it has been useful.

According to Walter L. Palmer (J. A. M. A., Nov. 18, 1933, p. 1604) the fundamental difficulty in the therapy of peptic ulcer is conceived to be that of protecting the lesion or the cells of the mucosa from the destructive effect of the acid of the stomach. Mucin or some such substance may form a coating over the surface of the ulcer and thereby protect it from the attack of the acid. Satisfactory proof of this has not vet been produced. Mucin does not accomplish com-

plete neutralization of the gastric free acid.

Atropine in physiologic doses decreases gastric secretion, but the attendant effects seriously limit its usefulness. Gastro-enterostomy may or may not lower the acidity but rarely produces complete neutralization. Subtotal gastrectomy usually results in complete and permanent anacidity. The objections to its general adoption are the relatively high mortality rate and the gravity of the lesions when they do recur.

Complete and continuous neutralization may be accomplished in many cases by the Sippy regime. Frequently however, it seems impossible to obtain satisfactory control of the free acidity even with large doses of alkali. In spite of this fact conservative medical therapy based on the principle of acid neutralization remains the treatment of choice for uncomplicated

pentic ulcer.

## SIPPY TREATMENT

The Sippy method of treatment consists primarily in protecting the ulcer from acid corrosion from the gastric juice by frequent feedings and alkalis given freely. The patient remains in bed for at least the first three or four weeks of the treatment. Three ounces of a mixture of equal parts of milk and cream are given every hour from seven in the morning until seven at night. After a few days soft eggs and well cooked cereals are gradually added to the diet. After about ten days the patient is receiving three ounces of milk and cream mixture every hour, three soft boiled eggs and nine ounces of cereal each day. Cream soups of various kinds and vegetable purees, eggnog, etc., may be substituted now and then as desired. Between the feedings the patients are given powders of magnesia and soda and of bismuth and soda to neutralize the acid secretion

Generally it seems advisable to give bismuth in large doses, at least 2 Gm. (30 grains) once a day. This can be taken quickly, stirred up in water or in milk.

Such treatment usually stops the pain. If pain is still severe morphine should be resorted to, but with this routine it rarely will be necessary, and the dose required,

hypodermically, is small.

It must be remembered that the pain is generally caused by the free hydrochloric acid, and the fact that pain disappears gives no evidence that the uker is healed. The lesion may still continue in a latent state and make its presence felt by symptoms when some renewed irritation occurs. Sippy's method gives enough alkali not only to relieve the pain, but also to neutralize all the free acid and to keep it neutral during the greater part of the twenty-four hours.

As these patients are already short on iron and for a number of days are to receive no meat, it is advisable to give the saccharated oxide of iron (eisenzucker), 3 grains (0.19 Gm.), in tablet form twice a day. The patient should thoroughly crush the tablets with the

teeth before swallowing.

If after a month of this therapy the patient cannot normally convalesce and be apparently cured—in other words, if the symptoms quickly return—an operation should probably be recommended, as the future of a

recurrent case is uncertain. Recurrent severe hemorrhage demands operation, and when there is perfora-

tion operation is immediately necessary.

Ralph C. Brown (J. A. M. A., Oct. 18, 1930. p. 1144) in a study of 1.224 cases of ulcer found that of 1,130 cases treated medically 49.5 per cent were reported cured, 16.7 per cent satisfactorily improved, and 10 per cent moderately improved. In 20 per cent, medical measures failed. Approximately 20 per cent of patients with gastric and duodenal ulcers require surgical care.

D. M. Clark and M. I. Gevman (J. A. M. A., Ian. 13, 1934, p. 107) insists that in more than half of all cases of duodenal ulcer the roentgen ray has a definite value in determining the response of the lesion to treatment. Roentgen disappearance of a duodenal ulcer niche following treatment indicates a favorable initial response but does not mean that the ulcer is completely healed. There is a wide variation in the amount of time required for the disappearance of the niche. As a general rule duodenal ulcers heal more slowly than gastric ulcers. Contour deformities of the barium filled bulb are not entirely dependable in the diagnosis of duodenal ulcer and they are of little or no value in determining the response of the lesion to treatment.

## HEMORRHAGE

In case of hemorrhage from the stomach perfect quiet must be insisted on. A hypodermic injection of morphine and atropine in full dose should be administered. If the symptoms show that hemorrhage is persistent 1 cc. (15 minims) of a 1:1,000 epinephrine chloride solution in 30 cc. (1 ounce) of distilled water should be given and followed in half an hour by from 50 to 100 cc. (about 2 to 3 ounces) of a 10 per cent solution of sterile gelatin. Ordinarily food should be withheld from forty-eight to seventy-two hours, no food being given even by the rectum. As nutrient enemas have been shown to increase the flow of gastric juice, the first enemas should be of physiologic sodium chloride solution and later peptonized milk and egg.

During the treatment of gastric ulcer the feces should be frequently examined for occult blood. When blood ceases to be present in the feces it signifies that the ulcer is healing and it indicates that larger quantities of food and that of a more solid character may be given. In case bleeding reappears after it has been absent for some days the patient should return to the former simple dier.

Some physicians believe that morphine should never be given to relieve the pain with hemorrhage, because it tends to increase the stasis and hyperchlorhydria that are present in uleer. Gelatin or any of the other colloidal solutions such as acacia may be utilized. It may be advisable to consider seriously the question of blood transtusion or the use of some of the hemostatic preparations described under the subjects of hemophilia and purpura.

## INDICATIONS FOR OPERATION

Harry A. Singer (I. A. M. A.) Jan. 13, 1934, p. 112) says "In addition to the classic and forme fruste types of perforated peptic ulcer there is a third variety which is characterized by intermittent attacks of extremely violent pain. The atpical symptomatology is presumed to be due to intermittent leakage occasioned by alternate spontaneous sealing and repopning of the perforation. The reopening frequently follows the intake of food which is not prohibited, since the true condition is seldom recognized. At any time following recovery from the first attack of pain, spontaneous closure may fail to occur, and the picture of a classic perforation supervenes. Knowledge of the clinical manifestations of a perforated ulcer with intermittent leakage is necessary to avoid errors in diagnosis and treatment.

Dr. William H. Mayo has caustically remarked that patients with ulcers should be operated on after they have had nine complete medical cures. Others have said there is no medical treatment of gastric or duodenal ulcer. The subject is one of the most debated questions in medical science today. Certainly the patient should have the benefit of the most competent advice available when the indications seem doubtful.

When there is marked tenderness at a location addernoom to the ordinary ulcer or if there should be a slight rise of temperature and an increased leukocytosis one may entertain the suspicion of an approaching perforation. In such a case no delay should be permitted before opening the abdomen and ascertaining the true condition.

Surgical treatment is indicated when the unhealed ulcer or the scar produces deformities which persistently interfere with gastric and intestinal function.

#### HYPERACIDITY

Practically, this term refers to increasing gastric disturbance, at various intervals after meals, or the ingestion of special kinds of food; heartburn is a common accompaniment. Tests with the stomach tube reveal either hyperacidity or hypersecretion, and the latter may be separated into a digestive and a continuous type. The latter, when appearing periodically, is known as Reichmann's disease or gastrosuccorrhea. Schmidt concludes that the stomach secretion varies only under pathologic conditions. Nervous influences come into play and the question arises whether or not there is an etiologic relationship between the hyperacidity of the stomach and the subjective symptoms. The anamnesis must not be depended on without the use of the stomach tube. Still more important is the question whether this hyperacidity occurs as a disease dependent only on nervous causes, or whether it always has some organic lesions as its source. Evestrain is frequently associated with hyperacidity and other forms of simple indigestion. Pus swallowed from pyorrhea alveolaris, from tonsils, or from any other part of the throat or air passages, will sooner or later cause indigestion and perhaps more serious trouble, although for some time the pus may be digested like any other animal food. Probably the bacteria are killed by the hydrochloric acid of the stomach. If, however, those bacteria are hastened through the stomach in alkaline mediums they may thrive and cause disturbances after reaching the intestines. Deteriorated foods, poor choice of foods, overeating, too rapid eating, irritants and irritating drinks, and too much iced water can all cause hyperacidity and other types of indigestion. Almost any abdominal abnormality and pelvic disturbance, especially uterine disturbances, can cause stomach indigestion. Primary ulcers and recurrent ulcers must always be considered as possible causes of the hyperacidity. The old term of gastric neuroses had better be abolished. There is always some tangible or reflex reason for a disturbance of the stomach and of hyperacidity. The purely nervous cases are less to the fore, but we would be premature in entirely denying hyper-

acidity in some cases as a unit per se.

Hyperacidity should be considered a symptom of disease rather than a disease itself. It frequently occurs in the sedentary and overworked and in connection with other abdominal disorders, such as appendicitis. pallstones, enteroptosis or uterine displacements. It is also an early sign of the beginning of hyperthyroidism and of tuberculosis, and it may be due to ear troubles or eyestrain. In addition to these general or exciting causes, the local conditions in the stomach must be considered. Any one who has had hyperacidity for any length of time will have certain pathologic changes in the gastric mucosa, hypersecretion and hyperesthesia, and we often find pylorospasm, hypermotility or gastroptosis. Schmidt classifies hyperacidities as follows: "1. Chemical hyperacidity with a normal quantity of gastric content after a Boas-Ewald test breakfast. 2. Chemical acidity combined with hypersecretion or with a continued secretion. Here the quantity of gastric content is abnormally and constantly large. 3. Chemical hyperacidity combined with hypersecretion and hyperesthesia. 4. Clinical or symptomatic hyperacidity with hyperesthesia. In this class of cases we have all the subjective symptoms of a chemical hyperacidity. In these cases we find a normal total acidity or even a subacidity. The symptoms are due to the hyperesthetic condition of the gastric mucosa, which is painful in a normal or even a subnormal acid content. 5. In this class we may find any one or a combination of the foregoing, together with pylorospasm, hypermotility or peristaltic unrest.

# TREATMENT OF HYPERACIDITY

The principal point is not to confine the active treatment entirely to the stomach but to calm and strengthen the nervous system. Diet is very important, and foods that act as secretory stimulants, like spices or coffee, should be avoided. As to special diets, it is difficult to keep them up for any length of time.

Schmidt offers the following rules: All food must be thoroughly cooked and thoroughly minced. The stomach must come to rest at least once during the twentyfour hours and the hour of the meals changed to secure this. Drinking should be generally diminished and restricted to times when the stomach is not filled with food, especially in cases of ptosis. If the condition is severe or combined with ptosis, he insists that the patient stay in bed for two weeks, and this he considers important. Sometimes hot compresses to the abdomen are used to bring relief-twice daily for two hours. At night they are replaced by compresses of cold water. Washing the stomach is indicated only when the hyperacidity is due to catarrh. Temporary relief, however, will always be afforded by the administration of an antacid, and the burning, distress, pyrosis and flatulence that may be present will all be relieved immediately by the administration of 1 Gm. (15 grains) of sodium bicarbonate. Such treatment is, of course, purely symptomatic. If it is advisable to give sodium bicarbonate, which is perhaps the best of all the antacids three times a day, before meals, the dose should be smaller, perhaps generally 0.50 Gm. (71/2 grains). It will act, as stated, as a gastric sedative and will soothe the irritated mucous membrane, will cause a quicker outpouring of the hydrochloric acid, and will thus hasten the completion of the protein digestion in the stomach, all of which will tend to make the disturbance better. If gastritis is present, no one treatment is perhaps more successful than the combination of bismuth and sodium bicarbonate, as:

		Gm.			
Ŗ	Bismuthi subcarbonatis	. 20	or	3 v 3 iiss	
M.	Sodii bicarbonatiset fac chartulas 20.	. 10		0 1155	

Sig.: A powder three times a day, before meals.

Bassler has suggested the following formula:

		m. or Cc.	
Ŗ.	Magnesii oxidi	10	3 iiss
	Bismuthi subcarbonatis	20 or	3 v
	Aguae destillataeq. s. ad	q.s. 200	fl5 viii

M. et sig.: Take one tablespoonful as required after meals, plain or in water.

A glass of hot water taken a half hour before the meal to wash off the mucus from the inflamed gastric mucosa is, of course, excellent treatment.

If the antacid is given after a meal the digestion of the starchy foods will continue longer than usual, on account of the alkali keeping the contents of the stomach alkaline for a longer time; free hydrochloric acid or

a large amount of acid peptones will not so soon be present to inhibit further salivary digestion,

If with the dyspensia, or gastritis, constipation is present, some magnesium oxide should be added to the foregoing prescription or substituted for the sodium bicarbonate. Also in hyperacidity the precipitated carbonate of lime is used, which is often a most successful treatment

If an antacid is indicated and diarrhea is present,

it is advisable to use lime water.

lacobson argues that we should exclude the chlorides from the diet in hyperacidity since these are the source of acid. Even after a prolonged salt-free diet, the tissues still supply chlorine to the gastric glands. In man the gastric juice is resorbed in the intestine, and the same dose of salt can be used again indefinitely for the secretion of gastric juice. The method of attack, then, is to use a well balanced diet save for the lack of chlorine. Foodstuffs eaten should be either naturally poor in chlorine or freed from it by boiling,

# SIMPLE CATARRHAL JAUNDICE

Simple catarrhal jaundice is due to a blocking, from more or less inflammation and swelling, of the common bile duct. While this duct alone may be involved, it is generally secondary to inflammation of the duodenum. This irritation and inflammation of the duodenum may itself be secondary to a simple gastritis, and the whole condition may be a sequence of serious maldigestion or infection and irritation from some deteriorated or toxin-bearing food. The ingestion of too much alcohol or too much of some simple irritant, as mustard or rich sauces, or of some irritant drug or an irritant poison may cause secondarily the condition of simple catarrhal jaundice. In a person who has had this condition once, or is predisposed to abdominal congestions, chilling of the abdomen, either

from a sudden change in temperature, or from exposure of an insufficiently clothed abdomen to cold air. may cause duodenal congestion and catarrhal iaundice.

This kind of jaundice is most likely to occur in the season of the year in which there are sudden changes to lower temperature, especially in the fall and in the early spring following warm periods. Whatever may be the exciting cause, cold frequently plays a con-

termed Weil's disease, and has been accredited to a spirochete known as Spirochaeta icterohemorrhagiae. This is ushered in with a fever, lasting one or two weeks, with a gradual decline in the second week, and

tributing part in the development of the disease. A true epidemic form of this disease has been

is attended with considerable prostration. Albumin may be found in the urine, and the spleen may be enlarged. Whether the simple catarrhal jaundice so frequently seen is a sporadic form of such an infection has not been determined. Until they have been proved to be related, it would seem well not to consider simple catarrhal jaundice as the disease described by Weil. Simple catarrhal jaundice generally develops insidiously, rarely shows any increase of temperature, and if there is a fever it is very low. Often the temperature is subnormal; there is considerable prostration; slow pulse; entire loss of appetite; some nausea; often vomiting: and there is likely to be constipation. although there may be diarrhea. The head feels dull, or there is real headache. The tongue is heavily coated, either brown or yellow. The breath is very bad, and there is a bad taste in the mouth. There is soon bile in the urine, and there may be traces of albumin. Jaundice may be present when the patient is first seen. Soon the stools are clay colored, and the skin is dry and irritated sufficiently to cause itching.

if it lasts much longer than four weeks, some other cause for the jaundice than a simple inflammation must The more the patient rests, the quicker will the jaundice generally subside. In the beginning a dose

be sought.

The perspiration generally stains the clothing. There is much mental depression, and inability to do mental work, but generally not much abdominal pain. The jaundice usually last two, three or even four weeks; of calomel, in amount considered sufficient, should be given, followed by a saline. A gram of bismuth sub-carbonate and a gram of sodium bicarbonate may be given every three hours during the day for two or three days, and then three times a day, before meals, for a few more days. The bowels must be moved daily by some simple saline or laxative water. If there is much epigastric tenderness and soreness, or if there is nausea, milk of magnesia in teaspoonful doses every three or four hours, in hot water, is advisable. The patient should be given plenty of water to drink, not too cold and better warm or hot.

For the first twenty-four hours, nothing but water may be given, unless food is especially desired. On the following day the nourishment should be bouillon or hot broths, tea, toast, thin oatmeal gruel, or some other simple thin cereal. Malted milk may be given, and in another day or two a poached egg or two, if they are well tolerated. All fats and milk, except possibly skimmed milk, should be avoided in catarrhal iaundice. It is a mistake to consider milk a good food in this condition. No cold foods or liquids should be given; anything cold taken into the stomach in this condition is probably disadvantageous. As soon as the sodium bicarbonate in combination with the bismuth subcarbonate is given less frequently, an alkali should be added, as potassium citrate, 2 Gm., in wintergreen water, 10 cc., three times a day, after the main nourishments.

As has been stated, the more the patient rests (in other words, the more he lies down), the better. There is less abdominal congestion, and the circulation in the congested region is improved. As an aid to resorption of the exudate in these swollen parts, abdominal warmth is suggested, and an electric heating pad or hot water bottle kept on the abdomen for hours at a time is good treatment. Diathermy, mild and properly applied, is of benefit. When the patient is up and about, the abdomen should be kept extra warm by flannel or absorbent cotton.

To relieve internal congestion and to increase the secretion of the skin and stop itching, a daily hot bath is advisable. The bath is of especial advantage in removing the irritating crystals that occur on certain parts of the body from the perspiration in this condition.

As the patient improves, the diet can be enlarged with oranges, baked potatoes, rice and more meat, the fats still being withheld, except that foods with cooked

milk, as custards, may be well digested.

If the jaundice lasts more than ten days or two weeks, ammonium chloride in half-gram doese, three times a day, after meals, is advisable. Ammonium chloride apparently increases the secretion of the mucous membranes. Probably it increases the secretion of the bile ducts as it does that of the bronchial tubes. It may be a valuable treatment in this condition, when the improvement is slow. The following prescription is suggested:

Mix and label: A teaspoonful, in water, three times a day, after meals.

## INTESTINAL STASIS—CONSTIPATION

The term intestinal stasis has of late years been used to designate what was formerly classed as constination, but with an extension to more serious cases which require surgical treatment. Intestinal stasis includes all cases in which the contents of the bowel fail to move in a normal manner, whether the cause be a mechanical obstruction or a functional failure due to the character of the intestinal contents or to the functional inactivity of intestinal musculature. The stasis may occur at various locations in the gastrointestinal canal, but the usual location in the cases under consideration are the lower part of the ileum, various sections of the large intestine and the rectum Hindrance to the evacuation of the feces may be due to a paresis of the rectum or sigmoid, brought on either by repeated distention with feces or by the use of daily large rectal enemas. In these instances help may be obtained by daily diminution of the bulk of water used. A very frequent cause of constination is inadequacy of fecal residue resulting from the general insufficiency of the food taken or from the fact that it contains too little of the indigestible vegetable matter (roughage) which favors the evacuation of the bowels. In such cases the feces are hard and dry, from the fact that during their stay in the large intestine the water has been absorbed to an undue extent. This form of constipation must be treated by proper diet.

#### DIET

The constinated person should add to his diet a quantity of fluid larger than normal in the form either of water or, perhaps, of buttermilk. Tea should be avoided, because it contains tannin, which may, by its astringent action, counteract the good effect of the larger quantity of liquid. Liquids should be given not only at meal times but in the intervals, so that they may serve better to replace the water absorbed from the large intestine. The diet for constipation should also contain as much fat as the patient can tolerate. The amount of vegetables which contain considerable quantities of cellulose should also be increased. This means plenty of vegetables. It is possible, however, easily to carry to extremes the eating of indigestible substitutes which add bulk to the diet. The accumulation of such masses in the bowel, even though evacuation is easy, does not have a favorable effect. Fruits should be given freely, except the astringent fruits. The amount of water taken depends on the patient's habits and the condition of the circulation. A patient who is muscularly active should drink more water than the one whose life is sedentary. A glass of water drunk in the morning while dressing is a great help to a physiologic movement of the bowels directly after breakfast.

#### LAXATIVE FOODS

The vegetables that are especially useful in this type of chronic constipation are cauliflower, cabbage, asparagus, salads, onions, celery and tomatoes. The cereals of importance are oatmeal and cornmeal, as well as graham, rye, whole wheat and bran breads. The following are also classed as laxative foods: honey, cider, molasses, apples, pears, peaches, oranges, melons, bananas, prunes, dates and figs. Buttermilk is preferable to sweet milk. Agara-agar in fine granules or in

powdered form may be added to a cereal or breakfast food, and is a most satisfactory help in constipation, owing to its ability to acquire water and to retain it, causing the fecal matter to be less dry.

## HARIT AND EXERCISE

The importance of establishing regularity of bowel action cannot be overstated. The patient should go to stool every morning at the same hour whether the desire is present or not, and should attend to the matter at hand, and especially should not read for diversion. It is especially important to use a seat that is not too comfortable and low enough so that the knees are flexed well up toward the abdomen; if the seat is too

high the feet may be raised by a footstool.

Abdominal massage, calisthenics, regulated exercise, walking, rowing, riding, golf playing, or any other muscular exercise that seems advisable should be ordered for the patient of sedentary habits. It must be urged on him that if the habit of constination is not now cured the future promises intestinal indigestion, dyspepsia, imperfect action of the liver, imperfect bile, nervous irritations, kidney irritations, and early cardiovascular renal disease; i. e., arteriosclerosis, weakening of the heart, and chronic interstitial nephritis. Still, however advantageous to the system daily movements of the bowel may be, many persons have actions only every other day, or even every third day, without apparent injury. On the other hand, there are advocates of at least three bowel movements a day as best for health.

#### MASSAGE

Before any severe exercise or any abdominal massage is ordered, or advised, a careful abdominal examination should be made and the physician assured that there are no inflammatory conditions present, as chronic appendicitis, gallbladder, pelvic or other disturbances.

Manual massage may be applied to the abdomen for fifteen or twenty minutes, beginning with light. circular stroking of the abdomen about the umbilicus. The parts should first be well lubricated with olive oil. The course of the colon is gradually massaged deeply, all fecal masses being broken up and moved down toward the rectum.

## MEDICINAL TREATMENT

Probably one of the most frequent treatments of constination consists in the administration of the fluid extract of cascara sagrada or some form of aloes or aloin. Sometimes podophyllin may be used separately or combined with other laxatives. There are no other laxatives or cathartics so likely to benefit constipation as these drugs. Whichever one of these is used, it should be given, week by week, in gradually diminishing doses. Whether they should be given in small doses three times a day, or larger doses once a day depends on the conditions. Generally, since the patient is not sick and is not willing to be bothered, and since the medicine requires a certain length of time to act, administration of the remedy directly after supper or at bedtime, in one dose, thus insuring a stool after breakfast, is the best treatment. However, even with the best possible care, when these drugs are given, some patients require a dose daily for months and even years, and cannot obtain a stool without it. This is generally not due to the effect that the mere giving of a pill has on the mind, as the substitution of an inactive tablet will prove.

Another excellent laxative is phenolphthalein. This drug generally acts well and, if given in tablet form, should be crushed with the teeth before swallowing; as it apparently acts better when well granulated. It should not be used too long as it may cause colonic and

rectal irritation.

In the simple constipation that is now being discussed, it is inadvisable to resort regularly to enemas of any kind or to more brisk cathartics than those mentioned or to saline cathartics.

Liquid petrolatum has achieved great vogue, as it acts merely as a lubricant, is inert, is easy to take and does not form a habit. In large doses it may cause

unpleasant rectal oozing.

A good general discussion of the whole subject appears in Fantus' "Useful Cathartics," published by the American Medical Association. To those especially interested a perusal of this book is recommended.

# SPASTIC CONSTIPATION

This type of constipation which is usually reckoned as a distinct variety, is characterized by the distress experienced during the act of defecation and by the appearance of the stools, which are narrow, sometimes of the caliber of a lead pencil, and often covered with mucus. Sometimes separate masses of mucus in the form of strings or membranes are passed with the stool or at times when no stool is passed. This spastic form may be due to some local irritation which causes spasm, as hemorrhoids and fissure, or to some pelvic irritation, but it usually occurs in neurotic patients and the whole clinical picture is dominated by the nervous element. It is necessary to recognize a constipation of psychic origin and one due to habit, which must be treated by suggestion and education with appropriate hygienic aids.

What has been said above refers to the treatment of a symptom and only in the mildest cases is it cutative in the sense of being addressed to the underlying leasion. Even in cases of spastic constipation which have been interpreted as pure neuroses, it is probable that an anatomic basis is present in the form of a colonic catarrh which is greatly aggravated by the nervous condition. Following Lane, a number of surgeons have explained the symptoms in a large category of abdominal and constitutional disorders as due to a mechanical hindrance to the passage of the intestinal contents and the consequent outer faction occurring.

in the howel.

in the lower.

Prosis of the various parts of the intestine is believed to form the basis of the obstruction from which the abnormal symptoms arise. In other instances it is supposed that such factors as adhesions or inflammatory membranes cause bends and kinks in the intestine which prevent the free movement of the intestinal contents. Unanimity in the interpretation of these facts has not been reached by clinicians. A number, including Einhorn, Bastedo, Wilcox and others, consider that the bands and ptoses do not account for the stasis as the symptom of stasis is frequently intermittent and persons with equal mechanical hindrances may be free from symptoms indicating the occurrence of putrefaction.

Unless there is a real mechanical obstruction or a definite organic lesion interfering with the intestinal

current, a temporary delay of the contents may not be significant. It may even serve to make absorption

more complete.

The usual simple habitual constipation does not cause auto-intoxication. As is well known, a patient may have no bowel movement for several days and still present no abnormal symptoms. The symptoms frequently associated with chronic constipation may be ascribed to nervous disturbances, and not to auto-intoxication. Reassurance and nerve sedatives in such cases will often do more good than drastic measures.

# SYMPTOMATOLOGY

The symptoms of the milder forms of intestinal stasis are the same as those commonly attributed to constipation. Much of such symptomatology may result from the effect of ptosis on a neurotic constitution. Nevertheless it is probably erroneous to attribute all symptoms observed in these patients to intoxication from the intestinal contents. A proper estimate of the effects of the various factors influencing the clinical course of such cases is important, as indicating the relative value to be assigned to the different measures of therapy employed. Some symptoms are produced mechanically from the pressure of the delayed fecal masses; others may result from dragging on adhesions or bands connecting different organs, and still others are due to nervous reflexes from irritation or inflammation of the mucous membrane of the colon. Lastly there are symptoms of actual organic lesions which may result from putrefactive changes in the contents of the colon. Such symptoms in severe cases may form a serious clinical picture.

# DIAGNOSIS

It is fortunate that we possess means of making an accurate diagnosis of intestinal stasis by means of roentgen ray examinations, either with roentgenograms or with fluoroscopy. In this way the length of time that is required for food to pass through the different sections of the intestine can be determined, and it may be learned at what point the delay, if any, occurs. Abnormalities in the contour and position of the different parts of the intestine can also be determined in the same way.

The existence of intestinal putrefaction is shown with certainty by the appearance of considerable indican in the urine. The extent of the putrefactive changes are not, however, easily estimated in this way, if, on shaking out the urine with chloroform after treating it with Obermeyer's reagent (a solution of ferric chloride in strong hydrochloric acid, 2 parts to 1,000), the chloroform has a deep blue color, a considerable amount of indican is present, and it is reasonable to assume that there is a considerable degree of intestinal putrefaction.

#### TREATMENT

The treatment of mild degrees of intestinal stasis is the same as that of constipation as previously outlined. To this should be added such mechanical supports as are necessary to obviate the effects of ptosis of the intestine. Agar-agar and fluid petrolatum are often of benefit in this condition. Sometimes all medical measures fail and surgical help must be sought.

#### HOOKWORM DISEASE

This disease is found in all tropical and southern temperate zones; in the United States southward from the Potomac River latitude through to the Pacific coast. The symptoms are anemia, laziness, lassitude, weakness, loss of physical and mental ability, and loss of weight. Children do not grow properly and adults become shiftless, incompetent, and poverty stricken, and they, with their families, become a tax on the community. Hence hookworm eradication is a measure of economic importance.

The hookworm was discovered, in Porto Rico, by Major Ashford, Surgeon of the United States Army, but to Dr. C. W. Stiles of the United States Public Health Service belongs the honor of having found the worm in the southern states and of having shown that it differs generically from the Old World worm, but that it causes the same symptoms. The American type of worm is called Necator americanus.

The disease can be discovered by giving the specific treatment in a suspected case and then sifting or washing the stools through cheese cloth, when worms will be found, if present. Billings and Hickey (J. A. M. A., Dec. 23, 1916, p. 1208) describe an excellent simple technic for this purpose.

## TREATMENT

Four drugs are now most frequently used in the treatment of hookworm disease: thymol, chenopodium, hexylresorcinol and carbon tetrachloride. In the administration of thymol the following technic is suggested:

Give little or no supper, and at bedtime a dose of magnesium sulphate. In the morning, as soon as the bowels have moved freely, one half the dose of thymol, in capsules, is given, and in two hours the remainder of the thymol. Two hours later another dose of magnesium sulphate is administered. After movements of the bowels from this dose food may be taken. Only coffee or tea. without milk, should be allowed during the period of the treatment, that is until the thymol has supposedly all passed out of the body. Absorption of thymol is not desired, as it may cause unpleasant symptoms. Alcohol and oils should not be given either before, during or even soon after the treatment. For one hour after taking the thymol the patient should lie on his right side to hasten the passage of the drug and liquid through the pylorus into the intestines.

The dose of thymol depends on the age, but is large. Ferrell suggests 4 Gm. (60 grains) for adults (that is, persons from 20 years of age upward). Doses for children and youths may be readily estimated by the following formula, namely: At 15 years, three-fourths the age, three-fourths the adult dose; at 10 years, onehalf the age, one-half the dose; at 5 years, one-fourth the age, one-fourth the dose; at 21/2 years, one-eighth the age, one-eighth the dose. If the patient is much underweight for his age, the dose should be reduced accordingly. The thymol should be powdered and placed dry in capsules. One-half the dose decided on is given at 6 a. m. If the bowels have been well moved from the dose of magnesium sulphate the night before, the other half of the dose of thymol should be given at 8 a. m., both doses being taken with plenty of water. Ferrell adds sugar of milk in equal parts to the thymol as he thinks the drug acts better with it.

In one or two weeks the treatment should be repeated, unless the microscope shows the feces to be free from the parasite and its eggs. Sometimes a third and even a fourth treatment may be needed. The action of the thymol may be hastened by (at the moment of swallowing) uncaping the cansules.

Thymol when absorbed acts like phenol, but it is slowly dissolved by the gastro-intestinal fluids and hence is absorbed slowly. Any oil or fatty substance hastens its absorption. Convulsions are probably not often caused by thymol poisoning, but great weakness and finally collapse are the gross subjective symptoms. Objective symptoms of its undestined absorption are albumin and even blood in the urine. Fatty degeneration of the liker and congestion of the side.

nevs and lungs are pathologic manifestations.

To forestall any possible great absorption of thymol after large doses are administered in hookworm disease, a brisk cathartic (magnesium sulphate, sodium sulphate sodium sulphate or potassium and sodium tartrate) should be given and repeated, if free eathersis does not occur within a few hours after taking the thymol. Castor oil, or any other oil, should of course not be the cathartic used. If symptoms of poisoning appear, stomach washing, colon washing, and sodium sulphate or potassium and sodium tartrate should be used to promote elimination. Strong black coffee should be given, hypodermic injections of atropine, strychnine and pituitary extract should be administered and the patient should be surrounded by dry heat. Later, any kidney congestion should be treated as an actue nephritis.

Except as a specific for hookworm, thymol should probably never be taken internally. As a bowel antiseptic it is too dangerous a drug to be used repeatedly,

unless the dose is too small to be of any value.

Ferrell's dosage for adults with hookworm disease is as follows:

Sig.: Take 5 capsules, with plenty of water, in the early morning, as soon as the bowels have moved. Take the other 5 capsules in two hours. Two hours later take ½ ounce of magnesium sulphate, which should be repeated if it does not act in four hours.

## USE OF CHENOPODIUM

The investigations of the United States Public Health Service have shown that oil of chenopodium (American wormseed oil) is also efficient in hookworm disease (Motter, M. G.: Pub. Health Rep., Oct. 2.

1914, p. 2651).

Wormseed oil seems to paralyze or stupefy rather than kill the hookworm; therefore it is very essential that soon after such action has occurred, a cathartic should be administered to cause evacuation of the worms before they can recover their vitality. Unlike male fern and thymol, castor oil may be administered with this drug. Any oil is likely to cause a dangerous amount of male fern and thymol to be absorbed. This is not true of wormseed oil.

The doses of oil of chenopodium suggested in this pamphlet are about 1 drop for every year of age up to 15. The drug is well administered in a teaspoonful of granulated sugar, every two hours, for three doses. Two hours later, a child of 10 years, for instance, should receive a tablespoonful of castor oil with onehalf teaspoonful of spirit of chloroform. The dose of castor oil and of chloroform should vary according to the age of the patient.

The oil of chenopodium has been found very satisfactory in this disease. The following method of

administration may be utilized for adults:

Preparatory Treatment .- At 7 a. m., magnesium sulphate, saturated solution, 60 cc., is given, and at 7 p. m., sodium sulphate, saturated solution, 90 cc. The next morning the administration of chenopodium is started. proceeding as follows:

7 a. m., oil of chenopodium, 15 drops, 9 a. m., oil of chenopodium, 15 drops.

11 a. m., oil of chenopodium, 15 drops 1 p. m., castor oil, 20 cc.; chloroform, 2 cc. 1:30 p. m., plain castor oil, 30 cc.

2 p. m., a cup of hot tea.

The dosage of oil of chenopodium for children from 6 to 7 years of age is 5 drops; from 8 to 9 years, 7 drops; from 10 to 11 years, 10 drops; from 12 to 15 years, 12 drops; 16 years and over, and under 60 years, 15 drops.

On the sixth day after treatment the stool is examined, and, if found positive, another course of treatment is given and the stool again examined at the end of the second six days. It is not necessary to place limitations on the diet as is the case when using thymol.

Possible undesired symptoms from wormseed oil are drowsiness and depression. Such symptoms occurring, rapid purging should be caused by a saline cathartic, and such stimulants as hot coffee or caffeine should be

given.

Roth has reported symptoms of deafness occurring in a number of patients following treatment with oil of chenopodium. This usually cleared up within a brief period of time, but in 2 cases persisted longer than one year. This fact should be borne in mind when oil of chenopodium is administered.

#### TISE OF CARRON TETRACHLORIDE

The value of carbon tetrachloride in the treatment of hookworm disease was first noted by Hall (1. d. M. A., Nov. 19, 1921, p. 1641). Since that time Lambert, Leach and others have administered the drug to thousands of patients and they report marked success with its use. They have found that it is a vermifuge and vermicide of great potency; that it gives little discomfort to the patient; that it permits rapidity of treatment, at low cost, of large numbers of persons, and that it has almost 100 per cent efficiency in ridding the intestinal tract of worms with a single dose.

# DOSAGE

The dose given is 0.2 cc. (3 minims) for each year of age up to the age of 15, when the adult dose of from 3 to 4 cc. (45 to 60 minims) is reached. The drug is placed in a tablespoon or in a small glass, covered with water, and swallowed. It was found desirable to administer a dose of magnesium subphate as a routine three hours after the drug. The drug is best given on an empty stomach and should not be given soon after alcoholic drinks have been taken.

Smillie and Pessoa recommended a mixture includion.

ing carbon tetrachloride, two parts, and oil of chenopodium, one part. The mixture may be given in doses of 0.2 cc. (3 minims) for each year of life up to the age of 15, at which point the adult dose of 3 cc. is reached; this should not be exceeded.

# USE OF HEXYLRESORCINOL

Among the more recent drugs that give great promise is hexylresorcinol, which apparently not only removes hookworms but Ascaris and to a less extent trichuris and possibly tapeworms. Patients of 12 years or above are given 1 Gm. and children 0.5 Gm. It is administered best in the morning on an empty stomach without food for four or five hours. A saline purge is often given but is not necessary. Although practically nontoxic, it exerts a local irritant action if chewed in the mouth. Gelatin capsules cannot be used and various oils and syrups are unsatisfactory. The best method of administration is a pill made by Sharp and Dohme, in which the crystals are rolled into a ball and coated with sugar.

### RESULTS OF TREATMENT

S. M. Lambert (I. A. M. A., Jan. 28, 1933, p. 247) reports 150,000 consecutive mass treatments of hookworm disease with the tetrachlorides without a death, more than 100,000 consecutive treatments with carbon tetrachloride without a death and with few untoward symptoms, and more than 46,000 treatments with tetra-chlorethylene without a death and without untoward symptoms.

The treatment used by B. K. Ashford et al. (I. A. M. A. Sept. 9, 1933, p. 843) is first restorative, to enable the giving of the anthelmintic, second specific, and third restorative again. They found that hexyl-resorcinol, ten capsules of 0.2 Gm. each, while it produced nausea and vomiting in several of the cases, appeared to cause no other deleterious effects and was

## TAPEWORM

Treatment to eradicate a tapeworm is based on several factors which, though simple, are fundamental. The treatment should be based on a knowledge of the worm, its pathology and mode of existence. The diagnosis of the presence of any of the tapeworms in the bowel must be finally settled by the finding of segments of the organism in the stools. Indefinite pains, a sense of distention or ravenous hunger are not unusual symptoms.

Before the anthelmintic is administered, several days should be devoted to the preparation of the bowel. The patient should take only a light liquid diet and should gradually cleanse the bowel by the use of the

following prescription:

M. Sig.: A tablespoonful, in water, three times a day, an

An enema of soap and water may be given at night. This treatment removes solid fecal matter from the bowel as well as any mucus which may be present. The night before the final treatment is to be administered the patient is given a cleansing dose, perhaps two tablespoonfuls of the mixture, and he then abstains from food and takes sparingly of liquids. The next morning after the bowels have moved male fern may be given as follows:

B Oleoresinae aspidii...... 4| or 3i

Fac capsulas, 8.

Sig.: Four capsules, with half a glass of hot water at 9 a.m., and four capsules, with hot water, at 10 a.m. [Important: Before taking these capsules each one should be uncapped.]

It has been suggested that any nauseating drug to be administered for the eradication of a tapeworm or other worms might be administered through a duodenal tube.

At 12 o'clock 3 tablespoonfuls of the magnesium sulphate mixture should be given, to insure the rapid passage of the male fern through the intestine, lest too much absorption take place.

During the morning nutrition other than black coffee, clear tea, or bouillon should not be taken.

Except when momentarily otherwise engaged, the patient should be in bed, and should stay in bed the remainder of the day. For unavoidable faintness coffee may be administered at any time, or a hypodermic injection of strychnine may be given. After one o'clock the patient may have any food that he desires.

During the three or four hours of this active treatment, viz., from 10 a. m. to 1 or 2 p. m., the physician should remain with the patient, or a trained nurse should be in attendance.

The stools should all be passed into receptacles where they can be thoroughly strained afterward, in order that the parasite's head may be sought. If the treatment is carried out as indicated the head will generally be found.

Pomegranate has been highly lauded by various physicians as an efficient anthelmintic in these cases. It is best given (in the form of a fresh infusion), after thorough cleansing of the patient's bowel as has been described. Three ounces of the fresh bark is macerated in 12 ounces of water for a half day and the infusion is then boiled down one-half. This quantity is taken within an hour, in several doses, and followed in another hour or two by castor oil.

When given in this form pomegranate may cause dizziness and extreme nausea. As an alternative an alkaloid derived from the bark — pelleterin tannate — is sometimes used. The dose is from 3 to 6 grains (O.2 to 0.4 Gm.), and should be given during fasting, mixed with a little water. A glass of water should be taken a short time after its administration and an hour

afterward a cathartic should be given.

Other vermifuges include turpentine, kousso, pumpkin seed and thymol. The pumpkin seed treatment is especially suitable for children. The seeds, which should not be more than a month old, should be shelled, and I ounce (30 Gm.) of these cleaned seeds should be beaten into a paste with I ounce (30 Gm.) of sugar. This whole amount should be administered to a child of 5 years or more in 2 ounces of milk. The child should lie down and should be kept quiet, and one hour later a dose of castor oil or some other cathartic should be given (J. A. M. A., July 17, 1926, p. 1925).

Pelleterin tannate is worthy of a trial. It is given after the usual preparation in a 0.5 Gm. dose and fol-

lowed in two hours by 2 tablespoonfuls of castor oil. If the bowels have not acted in an hour, an enema is given. The movements should be passed with the anus immersed in warm water. They should then be strained through black muslin. In case the worm does not appear after the cathartic has acted, 2 cc. of carbon tetrachloride is suggested, followed in one hour by another dose of a saline purgative, such as 15 Gm. of sodium sulphate.

In difficult cases one applies the old adage, "If at first you don't succeed, try, try again," but not until after three months at least and only after spontaneous expulsion of new proplottides.

It is most essential to get the alimentary tract as empty as possible without weakening the patient too much. In a resistant case the patient should be kept in bed and on a liquid diet (one and one half pints of milk and one pint of beef tea) for forty-eight hours and be given 30 ec. of castor oil the first night. The next afternoon, he should receive 30 Gm. of magnesium sulphate in a glassful of water. The third morning, another dose of saline purge should be given and the vermifuge administered two hours later.

A sufficient dose of the anthelmintic is the second item of importance. A dose of 8 cc. of the olcoresin of aspidium should not be exceeded, but that much is necessary in a difficult case. It may be administered in capsules (0.5 cc. each), two every fifteen minutes, until all are taken. Two hours later another dose of saline purge is given.

If the bowels have not acted in an hour, an enema will be of benefit. The motions should be passed with the anus immersed in warm water. They should then be strained through black muslin.

In case the worm does not appear after the cathartic has acted, 2 cc. of carbon tetrachloride, U. S. P., is advisable, followed in one hour by another dose of saline purgative; e. g., 15 Gm. of sodium sulphate.

Should this attack fail, a mixture may be used to hunt this elusive specimen, after one has waited the usual time required for the reappearance of segments in the stools to make certain that it is still there. Such a

mintics, is the "early bird" mixture, compose	wn anthel- ed of:
Pumpkin seed	8 Gm.

mines, io the	curry bird	mixture, composi	ou or .
Pumpkin seed			8 Gm.
Pomerranata			4 Gm.

made in an infusion, to which are added:

Kamala .		4 Gm
Oleoresin	of aspidium	4 Gm
Glycerin		15 cc.
Mucilage	of acacia	15 cc.
Water to	make 24	40 cc.

After the usual preliminary treatment, this quantity is given in two drafts two hours apart. Bastedo, from whose book this formula is taken, has several times seen severe gastro-enteric irritation with vertigo and prostration result from this mixture: but, he says, the

"early bird" usually gets the worm

The duodenal tube administration of the anthelmintic in resistant cases has been especially developed by Hans Schneider (Wien. klin. Wchnschr., April 3, 1924, p. 338). This method has the advantage not only of not risking loss of the remedy by nausea and vomiting, but also of avoiding its dilution by gastric contents, and of almost certain results with minimal dosage. The duodenal tube is introduced into the empty stomach the morning after a day's preparation with milk diet and cathartic. Half a dose of a senna infusion (5:100) is injected into the duodenum through the tube, and fifteen minutes later 2 Gm. of oleoresin of aspidium and 4 Gm, of extract of pomegranate mixed with the other half of the senna infusion is administered. Then the tube is promptly removed. The worm was expelled in toto within from half an hour to two hours in 13 patients, in many of whom the older methods had been used without success. The author records four failures due to insufficient dosage (half the dose stated above) or to the fact that the tube had not entered the duodenum.

Hexylresorcinol has also been found of value in helminth infestations. It can be given easily in crystalline form in hard gelatin capsules or in sugar coated pills. The capsules are not practical except for immediate use. The pills are stable and effective but must not be chewed up. The dose is 0.1 Gm, for each year of age up to 1 Gm. which is sufficient for adults.

## ASCARIS LUMBRICOIDES: ROUNDWORM

The roundworm is a common parasite which causes many indefinite symptoms such as vague colicky pains, foul breath and itching of the nose. The diagnosis of its presence can be made only by finding the worm in the feces or a worm may be vomitted. The common source of infection is water or food.

The worm is of reddish-brown color, about onefourth inch in diameter. The male varies in length from four to eight inches, the female from six to twelve inches. Though the intestinal tract is the normal habitat the worms wander, and they have been found in the larynx, nose, custachian tube, tonsil and other continuous structures.

### TREATMENT

The diagnosis having been confirmed, treatment should be begun by administering laxatives at night to cleanse the bowel. Santonin is a favorite vermituge for this condition, but many cases of poisoning have followed its use, therefore it should be given with caution. The dose is from 1 to 2 grains (0.065 to 0.130 Gm.). The drug may be prescribed in the following form:

Sig.: A powder, in water, every hour for three doses.

Thymol has been beneficial in these cases and American wormseed oil (oil of chenopodium) has given good results. The dosage of the latter may be 5 drops on a lump of sugar and this may be repeated and followed by a cathartic.

### OXYURIS VERMICULARIS: PINWORM

This worm varies in length from one-fifth inch for the male to two-fifths inch for the female. The former has a blunt tail, curved upward; the female, a pointed drawn-out tail. The most common symptom of the presence of these worms is itching about the anus, caused by boring movements of the female in depositing eggs in the rectum. The worm's chief habitat is the bowel from the jejunum to the anus. It is believed that the source of infection is the swallowing of ripe eggs in drinking water or food. The treatment consists in removing the worms by frequent washing of the region infected. Salts, such as magnesium or sodium sulphate, or a large dose of calomel, may be given.

Sulphur has been found of value in getting rid of these worms. It may be mixed with equal parts of compound licorice powder in a dose that is sufficient to cause semisolid stools. The dose for a child should

be modified according to its age.

To dislodge the worms from the rectum enemas should be given. Among various enemas which have been recommended are decoctions of quassia—an ounce of quassia chips in a pint and a half of water boiled down to a pint and strained; lime water; salt water; glycerin and water; turpentine—I drachm (3.75 cc.) to a pint of soap and water.

For local itching and abrasions such preparations as the official ointnement of phenol (2 per cent) or some mild sulphur ointment may be employed. An ointnement of ammoniated mercury, 10 grains (0.6 Gm.) to 1 ounce (30 Gm.), may be used with advantage to pre-

vent itching and infection around the anus.

Excellent results have been obtained in pinworm infestations by a combined treatment of oral and rectal administration of hexylresorcinol. The following treatment is suggested, to be given twice a week in the morning:

(a) Omit breakfast, and do not allow food until noon. (b) Give hexylresorcinol pills by mouth early in the morning. The dose is 0.1 Gm. for children up to 10 years of age; the maximum dose after this age is 1 Gm. Have the patient drink plenty of water. (c) Give a soapsuds enema and after its evacuation another enema of 1 part crystalline hexylresorcinol in 1,000 cc. of water. This enema should be given high and retained five minutes. (d) Boil the bed sheets and underclothes at least twice weekly to destroy eggs or worms passed on them. (e) Inspect the child's hands and nails rigidly and see that they are cleaned thoroughly after he has used the toilet.

## DISEASES OF THE KIDNEY

Pyelitis, 394—Renal Tuberculosis, 398—Albuminuria, 399—Acute Nephritis, 401—Chronic Nephritis, 405—Uremia, 409—Indicanuria, 412.

## PYELITIS

The causes for infection in the kidney, as elsewhere in the body, are lowered resistance of the tissue and the presence of an organism capable of infecting the kidney, coming usually from a focus elsewhere in the body. Ascending infection by the ureters should not occur as long as the peristalsis of the ureters is unimpaired and the ureterovesical valves maintain their integrity. Many infections are therefore probably hematogenous. The large number of such infections occurring in girls is evidence, however, that the condition is quite frequently a direct, ascending infection. Among the factors lowering the resistance of the kidney tissue, kidney stone is perhaps the most common, others being traumatism, urinary obstruction and displacement. The pyelitis of pregnancy arises from pressure of the gravid uterus which may mechanically obstruct a ureter. Not infrequently the pyelitis is a complication of such acute infectious fevers as typhoid and pneumonia. Among the various focal infections which may bear an etiologic relationship to pyelitis are tonsillitis, alveolar abscesses, and infections of the accessory nasal sinuses. Cholecystitis and intestinal infection are very frequent causes.

Examination of a person with pus in the urine, which is not apparently due to gonorrhea, is not complete without roentgenograms of the kidneys and cystoscopic examination, with catheterization of each ureter. In female pelvic trouble when there are bladder disturbances such as frequent urination and more than the normal number of leukocytes in the urine, even if evident pus is not found, cystoscopy should be done, as

frequently pyelitis is the cause of the bladder disturbance. If the pus comes from the bladder, there is generally no fever. Recurrent attacks of fever point toward pyelitis, especially when one or both kidneys are sensitive or painful. If deemed necessary, a test of kidney function should be made. G. L. Hunner (Am. J. M. S.C., February 1927, p. 157) finds that stricture of a ureter is not uncommon; that it may occur low down in the pelvic region, and that it is often a cause for incorrect diagnosis. Catheterization of the ureters would disclose this condition.

The organisms producing pyelitis are colon bacilli, tubercle bacilli, staphylococci, streptococci, gonococci, typhoid bacilli, paratyphoid bacilli and pneumococci, These infections are usually acute and persistent, may cause multiple abscesses, may destroy the kidney and may be fatal. An early diagnosis must be made by exclusion, as the symptoms are essentially abdominal and may simulate other disturbances, as appendicitis or gallbladder trouble. The most prominent symptom in kidney suppuration, besides fever, is marked tenderness at the costovertebral angle. The urine does not always show the micro-organism, but in advanced or serious cases it will contain leukocytes as shown by a milky appearance, and there will be a leukocytosis. usually not over 25,000. Polyuria, especially at night, is a fairly common symptom in children. A severe chill usually means a high grade infection. Staphylococci and streptococci nephritic infections are most frequent and have been observed following boils, tonsillitis, acute osteomyelitis, felon, ulcerations about the rectum and impetigo.

## TREATMENT

Primarily in the treatment of pyellits the cause must be sought, that is, the focus, the nephrolithiasis, or cystitis, and this condition treated. The patient should be kept at rest in bed on a modified diet. The liquid intake should be sufficient to cause the patient to pass from two to three quarts of urine daily and thus flush the kidneys out thoroughly. The bowels should be kept moving freely and regularly. The medicinal treatment of pyelitis depends on whether the urine is acid or alkaline. If the patient is troubled by frequency of and

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distress on urination, it is best to render the urine alkaline as it is then less irritating. The alkalization of the urine is furthermore an excellent method of treating the pyelitis, for the bacteria causing the pyelitis do not thrive in an alkaline medium. The alkalization of the urine may be accomplished by the use of alkaline drinking waters, fruit juices, or by acetates, citrates or carbonates. The carbonates are the most effective but are not always well tolerated by the stomach, in which case some of the other salts may be tried. It is best to use this method of treatment until the bladder irritability has disappeared and then allow the urine to become acid and to prescribe methenamine for a few days until the bladder becomes irritable again, when the alkaline treatment is resumed. Much smaller doses of methenamine than have been advised are of benefit. Ammonium chloride has been found to cause acidity of the urine (Helmholz and Millikin: Am. J. Dis. Child. December 1924, p. 700). Potassium citrate and sodium citrate are the preparations most commonly used. From 15 to 20 grains (1 to 1.3 Gm.) may be given every two hours during the day and perhaps every four hours during the night, to keep the urine alkaline. Other drugs, such as phenyl salicylate, methylthionine chloride U. S. P. (methylene blue) and the oil of sandalwood. also have been found valuable in the treatment of this condition.

Relief is frequently afforded to patients with pyelitis by ureteral catheterization and pelvic lawage with weak solutions of silver nitrate (1 per cent), mercuric oxygvanide from 1:10,000 to 1:5,000, or formaldehyde (1:20,000). Mild silver protein, collargol and other silver preparations have also been mentioned for this purpose. It should be remembered, however, that ureteral catheterization requires expert technic. Mercurochrome is used as an antiseptic injection in pyelitis. Whatever the solution used, after pelvic lavage unless there is free exit of the liquid, very severe colicky pains will occur. Sometimes a rotation of a kidney with slight twist of the ureter is the cause of this failure of rapid evacuation of the liquid injected.

In children, in whom the disorder is common, the majority of cases will yield to alkaline treatment, diet and rest. Vaccines are rarely useful in pyelitis. Autog-

enous vaccines may be tried, but they must be used with great caution, as violent reactions may be pro-

duced.

Mild cases of pyelitis are often unsuspected for months, and then perhaps pus in the urine is discovered by accident. Subacute pyelitis is generally made better by treatment, but tends to recur. Such cases should be energetically treated, and the patient should be told that a permanent cure is necessary for future health; the condition should be taken seriously by the patient. All focal infections must be sought, and if, after they have been removed, the pyelitis should again recur, other foci of infection should be unspected. Genital causes should be removed, and in persistent cases tuberculosis should be considered as a possible source.

F. H. Redewill and his co-workers (J. A. M. A., March 8, 1930, p. 688) maintain that the colon is a site of infection of the focal type that has bearing on acute infections of the urinary tract. The colonic focal infection must be cleared up before the urinary infection can be subdued or eradicated. They suggest regulation of the diet, the use of acidophilus preparations and implantation of colon bacilli by rectum follows.

lowing colonic irrigations.

If a purulent kidney does not soon improve, if the patient is becoming debilitated, or if the kidney is found enlarged and examination of the urine from this kidney shows that the kidney structure is diseased, temporizing should cease, and the kidney should be removed, unless the other kidney is so diseased as to render the operative

danger very great.

Ward Darley and W. B. Draper (J. A. M. A., March 3, 1934, p. 677) administered posterior pituitary extract in 16 cases of pyelitis. The solution was given subcutaneously in doses ranging from 3 to 15 minims (0.2 to 1.0 cc.). The intervals between injections varied from four to eighteen hours, and they were continued until all signs of acute illness had disappeared. Renal pain was promptly relieved by this treatment. The associated symptoms were also ameliorated but in a less spectacular manner. The results are probably due to accelerated drainage of the upper urinary tract induced by the posterior pituitary solution.

### RENAL TUBERCULOSIS

Renal tuberculosis is a progressive infection, slow in its development, often remittent and probably incurable by medical means. It may appear in the miliary form as a part of a general tuberculosis. There also exists a chronic parenchymatous nephritis occurring in the later stages of lung tuberculosis. According to some writers, there is an interstitial tuberculous nephritis. Most important, perhaps, is the type of minute focal infections tending to coalesce almost invariably unilateral at first and occurring in persons not affected with active tuberculosis. This is the form usually meant by the term renal tuberculosis. There are no diagnostic symptoms for the early stages. The first manifestation is vesical irritability, followed later by albuminuria and perhaps hematuria. The symptoms are apt to be confused with those of renal stone. Tubercle bacilli in the urine are often not readily discovered, and may be confused with other bacilli occurring in this region. Consequently, a guinea-pig test should be made, if it does not seem advisable to make a tuberculin test. Often before tuberculosis of the kidney is seen but more frequently soon after such a condition is discovered, the lungs will show a tuberculous process which, if not found by physical examination, is generally discovered by roentgenograms. Pyelography is an important aid to diagnosis. Pus in the urine appears soon after the start of the infection and with it the tubercle bacillus. The blood stream is the mode of invasion except in very rare instances. Usually only one kidney is affected in the beginning but later the other kidney may become involved. There is but one satisfactory way of treating the patient. namely, by nephrectomy. If performed early this gives immediate relief in seventy-five per cent of cases, and permanent cures in perhaps fifty per cent.

Gilbert J. Thomas (J. A. M. A., Jan. 25, 1930, p. 229) says that renal tuberculosis is not a primary disease but is secondary to generalized disease. It is during the active stage of the original pulmonary or other lesion of tuberculosis that the kidney becomes infected and that the early lesions develop. In the majority of instances renal tuberculosis is bilateral. One infected kidney should not be removed until it has been infected kidney should not be removed until it has been

proved conclusively that the other does not contain a destructive lesion. Nondestructive lesions will heal and the patient with this type of lesion should have the advantage of sanatorium treatment to assist him in building up resistance to the tuberculosis. After nephrectomy for renal tuberculosis the patient should be kept in a sanatorium until no evidence of active tuberculosis, urinary or otherwise, can be found.

Stanley L. Wang (J. A. M. A., Jan. 25, 1930, p. 235) treated a number of patients with rologic tuber-culosis, with gradually increasing doses of tuberculin, and reports the results in 14 who were under treatment for three months or longer. Eight patients seemed improved; in 3 the condition seemed stationary and in 3 it apparently retrogressed. He states that it is evident that tuberculin is not a cure for urologic tuberculosis, but it cannot be dismissed as not having any value. In the treatment of inoperable and postoperative patients, it has seemed to be a helpful factor in the therapeutic regimen.

## ALBUMINURIA

The appearance of albumin in the urine may be due to any one or more of many different causes. These may be classed as follows:

- 1. A symptom of nephritis.
- Accidental albuminuria:
   (a) Dietary (alimentary).
  - (b) Chilling of the body.
  - (c) Unexplained infection (frequently focal).
- 3. Incidental albuminuria:
  - (a) Cold baths.(b) Menstruation.
  - (c) Athletics or other physical strain.
  - (d) Cardiac weakness.
    (e) Irritation in some part of the urinary tract.
    (f) Hypertension.
  - (f) Hypertension.(a) Ether or other anesthesia.
- 4. Orthostatic albuminuria (lordotic, cyclic, adolescent).

Albumin in the urine comes either from the kidneys or from some other part of the urinary tract. If it is the result of a localized irritation, inflammation or hemorrhage, there are more leukocytes present in the urinary sediment than in ordinary albuminuria. In case of hemorrhage erythrocytes will be found. Albuminuria

caused by nephritis will be discussed under that head. When albuminuria is caused by any of the conditions listed as accidental or incidental, the prevention and treatment is self-evident. Athletes and others performing severe muscular exercise not infrequently give evidence of a temporary albuminuria. Bornstein and Lippmann (Zisther, F. kin. Med., March 1918, p. 345) noted a striking parallelism in such cases between the excretion of albumin and the acidity of the urine. The frequency of cylindroids in the urine also seemed to be related to the concentration of urinary acid. These phenomena—albuminuria and cylindroids—were checked by administration of alkali during the exercise or working period. Extra acidity of the urine may be due to increased muscle activity.

Orthostatic albuminuria is shown to be related to lordosis which produces a passive hyperemia of the kidneys with leakage of albumin. It should be limited to that albuminuria without casts which occurs after standing or moving about, and which disappears with a reclining position. It may also be due to an insufficiency of the kidney circulation, possibly congenital, with or without lordosis, or to certain occupations which throw an especially large amount of work on the kidneys, resulting in passive congestion. Before the albuminuria is considered a simple albumin leak, all suspicion of more serious conditions of the kidneys must be eliminated by examinations of the urine under varying conditions. Casts must be absent, and there must not be any cardiac hypertrophy or other symptoms which would show that the kidneys are suffering from localized or general inflammation.

The results of examinations of the urine obtained when the patient first rises in the morning and again in the latter part of the afternoon will show whether the condition is an orthostatic albuminuria. Dietary and

exercise tests will also show the limitations of the kidneys and their ability to sustain increased work.

Robert Sterling Palmer (J. A. M. A., May 9, 1931, p. 1559) finds that a slight trace of albuminuria in young male adults without other signs of renal disease is of comparatively little significance and persisted in only 1 of 35 cases followed after eight years. Positive family history of vascular disease and underweight

seemed to be factors associated with functional albuminuria. Poor posture was not found significant. Palmer believes that the pathogenesis of functional albuminuria is not clear but may be the result of stasis producing a local acidosis. He concludes that treatment of the condition is unnecessary and the individuals exhibiting this sign should not be excluded from normal physical exercise.

### TREATMENT

Strenuous exercise should be forbidden, and the body functions should be regulated in an effort to secure as near an approach to normal as possible. A great deal of rest is essenital. Anemia should be looked for and treated. The condition of the heart should be studied and regulated. The bowels should be regulated and the intestinal condition kept normal by the use of a carefully chosen diet. Sea bathing and cold bathing are prohibited. A warm bath may be allowed regularly to aid elimination through the skin. Alkalis may be administered experimentally but their effect on the urine should be carefully noted.

## ACUTE NEPHRITIS

There have appeared a number of new classifications for the different forms of nephritis. Many are complicated and based on data that can be furnished only by microscopic examination of the removed kidney. Nephrosis is a term that is being applied to some forms of inflammation of the kidney, but the name has not been generally accepted and we will not discuss the controversy here. A simple classification is offered by H. A. Christian (J. A. M. A., Nov. 28, 1925, p. 1701) as follows:

Acute nephritis Subacute nephritis:

- 1. With edema
  - 2. With hemorrhage
- Chronic nephritis
  - 1. With edema (hypertension rare until late stages) 2. Without edema (hypertension most of time) 3. Vascular hypertension progressing into nephritis.

Acute nephritis arises as a result of injury to renal

parenchyma due to bacterial infection or chemical

toxins. To the first of these belong the acute nephritis of scarlet fever and the other acute infections, though there may be a toxic element in addition. The classic example of the infectious type of acute nephritis is that which follows an acute tonsillitis or simusitis. As examples of the toxic type, we have the cases following extensive burns and poisoning with such substances as turpentine, cantharides, phenol, the salicylates, potassium chlorate, iodoform, mineral acids, arsenie, phosphorus, mercury and lead. The acute nephritis of pregnancy is also probably in part of toxic origin. Alcoholism is of itself probably not a cause of nephritis, but the exposure that so often accompanies excessive use of alcohol may give rise to an acute infection which is the source of the nephritis. Bacteria are present in nearly all types.

As to prognosis, the acute nephritis may clear up entirely, it may become chronic, or it may end fatally as a result of uremia, anasarca, a pneumonia or other terminal infection. In some instances there results a permanent albuminuria which is not, however, accompanied by symptoms of renal disease. In fact, in these cases there is no impairment of renal function as shown by such functional tests as the phenolsulphonpithalenit test. The cause of this albuminuria is probably a permanent cicatrization in a portion of one or both kidneys which is, however, not sufficient to impair the renal function.

## GENERAL TREATMENT

The patient should be put to bed in a warm, well ventilated room. Irritant drugs should not be given; cold applications should be avoided and also all chilling of the body. Baths should be taken in warm or hot water. Meat and meat proteins should be eliminated from the diet as soon as albumin is found in the urine and the foods should be restricted to milk, thin gruels and barley water. If possible the diet should be very free of salt. It is generally considered advisable because of the edema to restrict the water intake, but if the diet is salt free a moderate amount of water may be allowed. A refreshing drink may be prepared from a teaspoonful of cream of tartar in a pint of boiling water to which is added the juice of a lemon and a little sugar.

If the patient's stomach is disturbed, a short starvation period is advisable. Liberal quantities of hot water may be given to relieve the vomiting, and if this is not sufficient, several 1 Gm. doses, each, of bismuth subcarbonate and sodium bicarbonate should be given every three hours until relief ensues.

To promote elimination the body should be kept quite warm and hot sponge baths given. Warm applications may be applied to the kidney region. A few grains of calomel, or a saline purgative, should be given to free the intestinal canal of toxic substances. In children rhubarb or cascara sagrada may be used. Enemas may be substituted for the cathartics. Diuretics are forbidden with the exception of water, to which sodium citrate or orange or lemon juice may be added

As has been stated, the patient should be kept physically and mentally at rest. If he is restless and cannot sleep a dose or two of chloral or of a bromide may be given. It is well to avoid the synthetic drugs because of their irritant effect on the kidney.

Warm applications to the kidney region will aid in allaying the inflammation and in hastening the stage of resolution. These applications may be applied as hot alcohol and water fomentations bound close to the back by a bandage around the abdomen, kept warm by a hot water bag and changed as soon as cool; by the old fashioned flaskeed poultice; by an electric heat pad, or

by any other simple method.

Under treatment, the albumin and casts usually disappear in from five to six weeks. During convalescence the diet is gradually increased, a little salt being given from time to time. The patient may be given bread, rice, more cereals, potatoes, less milk and no meat. Small doses of iron (tincture of ferric chloride, 5 drops three times a day) may be given in orangeade or lemonade. Saccharated ferric oxide, 3 to 5 grains (0.2 to 0.32 Gm.), may be given in tablet form. Eggs, vegetables and fruit are gradually added to the diet and then, after some weeks of a normal output of urine, meats in small quantities may be tried.

The signs of uremia are blurring of vision, possibly retinal changes, severe headache, momentary losses of consciousness, twitching of the muscles, cramps and eventually convulsions and coma. The treatment of uremia is discussed elsewhere. It has been found that thyroid medication in large dosage is frequently of value in impending uremia and in puerperal eclampsia, probably because of the ability of thyroid secretion to counteract nitrogenous poisoning. Small doses are often of benefit for the dryness of the skin that occurs in chronic nephritis.

Treatment of acute nephritis by nephrotomy or by renal decapsulation has been done, especially in those cases in which there is an abundance of lumbar pain but no severe urinary symptoms. These operations have in some cases caused relief of symptoms, but they should be tried only as a last resort. The resulting scar tissue as it contracts may of itself aggravate conditions, especially if a chronic interstitial nephritis should

ensue. As many cases of acute nephritis are due to bacterial infections the question of the use of vaccines may arise. Vaccines as yet have not proved to be of any value in the treatment of nephritis in the acute, subacute or chronic stages.

Henry A. Christian (J. A. M. A., Jan. 20, 1934, p. 169) says "Only in the very early days of a very acute nephritis should diet be restricted in both amount and variety. For a week in such cases a diet of fruit juices and carbohydrates with restricted fluids is advisable."

Since infection has an etiologic relationship to acute nephritis, it should be treated as adequately as possible and due consideration should be given to the eradication

of real foci of infection.

In acute nephritis there is practically no indication for drug medication. Edema is rarely marked in degree and only then should diuretics be used. Sweating no longer is considered advisable. Exposure to cold and

wet should be guarded against.

A patient with nephritis should remain in bed at complete rest as long as there are indications of gradual clearing of the activity of the renal process. If after prolonged rest, no change in the activity of the process occurs, physical activity should be permitted in increasing amount, provided it does not cause increase in blood cells in the urine

### CHRONIC NEPHRITIS

Chronic nephritis, Bright's disease, or as it is sometimes called, cardiovascular-renal disease, is increasing in frequency in this country; therefore its prophylactic

treatment is very important.

Patients suffering from this disease usually first consult a physician on account of the symptoms that are ordinarily associated with high blood pressure. In some of the cases there is a history of a previous acute nephritis, of acute inflammatory rheumatism, or there may be an old heart lesion or some other point in the history that suggests the cause of the nephritis. In the majority of the cases, however, this history is not found and a physical examination reveals nothing but a slightly enlarged heart and a slight edema of the feet. Urinalysis may reveal nothing, but on repeated examinations the urine will be found to be of low specific gravity and occasionally to contain casts and a trace of albumin. The blood pressure will be found to range from 170 to 200 or more systolic, with a diastolic reading above 100. In these cases a careful search for a chronic focus of infection sometimes reveals trouble in the tonsils, teeth, sinuses, or gallbladder. All foci of infection should be cleared up, if possible,

## SYMPTOMS

The general symptoms of chronic nephritis may include, in addition to the characteristic changes in the urine, headache, indigestion, diarrhea or constipation, mental apathy or irritability, insomnia, dyspnea, edema, intermittent eye and ear disturbances, enlargement of the heart, high blood pressure, neuralgias, anemia and retinal changes.

### TREATMENT

The diet selected for persons with chronic nephritis should be based on the excretory ability of the kidneys, the nonprotein nitrogen content of the blood, the condition of the heart, the blood pressure, the state of the digestion, the weight of the patient and the physical and mental work required of him. The diet should be varied quite frequently. It is well for the patient to have nothing but skimmed milk one day in the week. It has not been shown that fresh fish, poultry and meat.

except kidneys, sweetbreads, liver and shad roe (rich in purins), are any more harmful to the nephritic patient than are the vegetable proteins such as nuts, peas, beans and oatmeal, though some patients may tolerate these better.

In the cases in which there is organic heart trouble with signs of decompensation this must be treated primarily, and as the heart condition improves so will the kidney trouble. The best treatment for patients with cardiac edema is rest in bed on restricted liquids and a soft, meat-free, salt-free diet. In the more severe cases the Karell management is efficacious. The Karell treatment consists of rest in bed and a light diet of milk and eggs. The fluid is limited to 11/2 pints a day. At first this is given, for two or three days, as milk only, 6 to 7 ounces at 8 a. m., and the remainder in equal parts every four hours until 8 p. m. This is the most trying part of the method for the patient. Then one egg is given at 10 a. m., and a hiscuit at 6 p. m. for two days. Then two eggs with bread, and a little minced meat are allowed. In twelve days the patient returns to a carefully planned ordinary diet, the fluid being still kept down to 11/2 pints, but not necessarily only milk. This method is indicated for weak hearts for which digitalis is less appropriate. About the third day of this treatment, diuresis sets in for a short time, the dyspnea is relieved, the pulse improves and the edema subsides. Elimination through the gastro-intestinal tract should be promoted by the use of calomel (2 or 3 grains or 0.130 to 0.195 Gm.) at night and salines in the morning. Venesection may be indicated in such cases and often causes noticeable improvement, by lessening the burden on the heart and removing toxins. The same management is applicable in the cases in which the kidney is the most affected

A most important item in the treatment of chronic nephritis is the preservation of cardiac compensation. The high blood pressure and cardiac hypertrophy of chronic nephritis constitute a compensatory mechanism enabling the kidneys to maintain adequate function. Consequently they are essential to the preservation of life and should be protected by every hygienic and dietetic safeguard. High blood pressure should

not be made the object of direct therapeutic attack. Nitrites should be reserved for emergency use to combat such developments as angina or cardiac asthma. The appearance of dropsy in primary chronic nephritis almost invariably signifies the advent of cardiac failure. At this stage digitalis becomes the mainstay of treatment and should not be withheld because the blood pressure is high, as it acts just as well, or even better, with a high blood pressure as with a falling pressure, provided the kidney excretion is not diminished.

Digitalization of a patient with nephritis is inexcusable, as the defective elimination due to insufficiency of the kidneys makes digitalis poisoning very dangerous.

In the cases that are primarily cardiac the use of caffeine, digitalis, and the other cardiac tonics is of great value. The use of theobromine and other drugs, the action of which is essentially diuretic, should be guarded, as in many cases of chronic renal disease they do not increase the output of urine and act rather as a poison to the system. When edema occurs in kidney inflammation it is often associated with some toxemia due to an increase of nitrogenous poisons in the blood. Consequently, in such a case the patient may be harmed and not helped by deprivation of water. He should be given a diet which is suited to the state of nutrition, the condition of the heart, and to the ability of the kidneys to excrete, as shown by tests. Bannick (Arch. Int. Med., May 1927, p. 741) has found that uremia may rarely occur without hypertension in chronic glomerular nephritis.

## ARTERIOSCLEROTIC TYPE

Another form of chronic nephritis is caused by general arteriosclerosis. In this there are two causes for the trouble, namely, the injury to the kidney parenchyma from the altered blood supply to the kidney and the toxemia arising from the altered metabolism throughout the body which is due to impairment of the circulation from the arteriosclerosis. Here the treatment must necessarily be entirely palliative, as the cause cannot be removed. Persons with this type of nephritis are usually weak, anemic and poorly nourished and consequently do not do well under severe sweating or other strength depleting treatments. The Karell man-

agement is the best in severe cases of this kind, but ordinarily some restriction of liquids and a careful diet and free cathariss suffice to keep these patients comfortable. In these cases diuretics and cardiac stimulants must be used with great care and in many of them are contraindicated.

In nephritis in which there is amyloidosis the treat-

condition is secondary to it.

## CARDIOVASCULAR-RENAL DISEASE WITH HIGH BLOOD PRESSURE

Many of the patients with long standing cardiovascular-renal disease are to all appearances in excellent health, but have a constant high blood pressure and much of the time have albumin or casts in the urine. Most of them may be kept very comfortable and the blood pressure kept reasonably low if they will diet carefully, rest enough and exercise only moderately. Such individuals should eat little meat of any kind and abstain absolutely from coffee, tea, alcohol, rich spiced foods and tobacco. The diet then should consist of fruits, cereals, vegetables, eggs, milk, cream, butter, and in most instances a little meat once a day. Shell fish may be used in moderation. In all types of nephritis, chronic focal infection may play a very prominent part in the cause of the kidney inflammation. Consequently, focal infection should be sought and, when possible, eliminated. Pyorrhea alveolaris is frequently present in the period of life in which cardiovascular-renal disease occurs.

These patients may exercise moderately, and it is advisable that they get a definite amount of out door exercise. Walking is the best form and, for some, golf in moderation is permissible. Whatever kind of exercise is taken, it should be begun gradually and increased slowly. While this is being done the patient should be frequently examined by the physician to make

sure that he is not overdoing.

## MASSAGE AND BATHS

The massage and bath therapy of nephritis, when regulated by a physician who is in close touch with the patient's general condition, is excellent. However, unless controlled by a physician, such treatment may do a great deal of harm. Massage is only a form of exercise and, if overdone, may do as much harm as too much exercise of any other sort. Sweat baths are quite enervating and fatiguing even to a healthy individual who is not accustomed to them, and to the nephritic patient with his lowered vitality they may be a source of great danger.

#### CLIMATE

Patients suffering from chronic nephritis should spend as much time as possible in warm climates, as warm weather promotes elimination through the skin. Furthermore, by causing a superficial vasconstriction, cold tends to increase the tension in the deeper vessels and so multiplies the possibility of cerebral hemorrhage or hemorrhage from other vessels. Angina pectoris, which may be a complicating factor in many of these cases of hyperarterial tension, often follows sudden exposure to cold.

## UREMIA

When uremia is imminent premonitory symptoms occur, such as headache, fulness of the head, vertigo and blurring of vision, muscle twitching, muscle cramps, restlessness, insomnia or drowsiness and frequently nausea, vomiting and diarrhea. The blood pressure increases and the urine shows a decrease in the amount of solids excreted. Convulsions followed by coma, or coma quickly developing without convulsions, are prominent symptoms of uremia. Chilling, a high protein meal, extra muscular exercise, nervous or mental excitation, or anything which suddenly increases metabolism and nitrogen waste may precipitate an attack.

Lyttle and Rosenberg (Arch. Int. Med., June 1927, p. 808) have studied the cerebrospiand luid in nephritis when uremia was present and when uremia was not present. They found that this fluid is generally clear; that the cell count varies from 2 to 16 per cubic millimeters, and that these cells are mostly lymphocytes. They found that the presence of uremia had no relation to the cell count. The nonprotein nitrogen of the cerebrospinal fluid was greater with kidney inflammation; the chlorides remained the same, and there was an

increase in the albumin and globulin content in chronic nephritis, especially when uremia was present. They found the prognosis to be grave when the protein was more than 100 mg. per hundred cubic centimeters. In more than half the cases studied, there was an increase of sugar in the cerebrospinal fluid.

### TREATMENT

The diet in impending uremia should be minimum, perhaps only as much as a pint of milk a day. The water intake should depend on the amount of water elimination, edema and dropsy. As the diet is increased, considerable alkali and cereals may be given to combat acidosis.

In uremic patients there is a severe toxemia due to renal insufficiency. When the patient is quiet, the relief of the toxemia is the chief objective except such supportive measures as may prove necessary. This toxemia has usually been treated by the promotion of elimination through the skin by sweats, through the intestines by free catharsis and rarely by venesection. Profuse sweatings, so long advised in uremic conditions, are not sound treatment. Sweating can remove little from the blood except water. Water having been removed, the blood becomes more concentrated, and therefore each cubic centimeter will contain more of the poisonous nitrogenous matters than before, thus increasing the uremic condition. This does not mean that occasionally a patient may not seem to be benefited by such sweatings, but such improvement is accidental and not the result of the treatment. It is much more logical to remove some blood by venesection and then replace the loss by physiologic sodium chloride solution, thus diluting the cerebral irritants in the blood. If the heart is in good condition, purging is a valuable aid in relieving systemic symptoms and a rapidly acting cathartic is necessary. One or 2 drops of croton oil on sugar is the most efficient. Compound jalap powder is the best cathartic for subsequent treatment, or in mild uremic conditions as the primary cathartic. Following or coincident with watery purging, large amounts of water should be ingested or be otherwise administered. The diuretics are generally of little use in treating these conditions. Fischer's solution administered intravenously or by rectum has proved to be one of the best methods of promoting elimination through the kidneys in such cases; the general symptoms are also greatly refleved, even when sweating and venesection are not used. Striking results have been obtained by the use of Fischer's solution in instances in which there was insufficient excretion of urine and a consequent uremic condition without clinically demonstrable anasarca.

A. D. Hirschfelder (f. A. M. A., April 7, 1934, p. 1138) points out that there is a clinical syndrome of high plasma magnesium accompanied by somnolence or coma. This may be induced in patients with renal insufficiency by the oral administration of one or more purgative doses of epsom salt. Many cases of coma in nephritic patients, diagnosed uremic coma, may be simply magnesium coma induced by epsom salt purgation. Patients probably could be awakened from such coma by intravenous calcium chloride. Sodium sulphate is perhaps preferable to epsom salt for patients with

RESTLESSNESS

In those cases of uremia in which the patient is extremely restless, and also in those in which there are convulsions, the eliminative treatment must be used, and in addition the patient must be quieted. The usual methods of restraining a patient in bed must be practiced; windows should be protected to prevent accidents; all instruments with which the patient might injure himself or attendants should be kept out of reach. Bromides may be given in enemas in doses of from 20 to 30 grains (1.3 to 1.9 Gm.). If the patient will take them, they may be given by mouth. Chloral may also be administered either by mouth or by rectum. In the more severe cases it is necessary to use opiates and sometimes even chloroform inhalations to quiet the convulsions.

#### VENESECTION

If the blood pressure is very high, and apoplexy or sudden dilatation of the heart threatens, venesection should be done. It is also indicated in threatening convulsions or coma.

#### INDICANURIA

Indicanuria is of comparatively frequent occurrence and signifies that some protein putrefactive process is taking place in the ileum and colon with the production and absorption of indole and the excretion of indoxyl potassium sulphate (indican). Indican in the blood is not poisonous, but other products of decomposition and toxins absorbed from the intestines at the same time as the indole may produce symptoms of intosication. Indole, skatole and cresol with toxalbumin frequently produce symptoms of poisoning such as headache, restlessness, insomnia, gastro-intestinal indigestion, dryness of the skin or sometimes a profuse perspiration, eruptions, and even a rather severe kidney irritation.

#### TREATMENT

If it is found that the amount of indican excreted is increased, the diet should be modified. Animal proteins should be removed for a time and there should be thorough purging. The cause of the condition should be sought. The bowels should be caused to move daily and regularly; colon washings may be given until the urine is practically indican free. Yeast, lactic acid bacilli, or Bacillus acidophilus cultures may be administered, but it is doubtful whether they exercise any very prolonged effect. Liquid petrolatum is now much used but it is a question whether it may not interfere with the secretions, if given over long periods. Phenyl salicylate in a dose of 0.25 or 0.30 Gm, in capsules, three times a day after meals, for a short period is often of benefit in preventing intestinal fermentation. Anemia is not rare accompanying chronic intestinal putrefaction. The weight of the patient should be noted carefully and the skin watched for the appearance of eruptions, dryness or profuse perspiration in order to regulate properly the food, drink and possible drug administration which may be required.

# DISEASES OF METABOLISM

Diabetes, 413—Diabetes Insipidus, 441—Pellagra, 442—Gout, 447—Obesity, 450.

#### DIABETES

Diabetes has increased more rapidly than any other disease of which we have records in the last fifty years. It occurs at all ages, but most frequently, in both men and women, after 35 years of age. In the United States the Tewish people show the highest death rate from diabetes and the Negro race the lowest, and the majority of the deaths occur during the cold months of the year. Joslin finds that modern treatment has prolonged the average life of the diabetic patient, While he notes the increase in the number of cases, he says that many are of a mild type. This probably means that more cases are discovered early than previously. The increase in diabetes is shown by his statement that every child saved from infectious diseases or rescued from typhoid or tuberculosis is a candidate for diabetes after 40 years of age. In Boston and in New York, one death in sixty is due to diabetes. Joslin thinks that the reason the disease is so frequent in Jews is that they are generally fat at the age in which the disease is likely to develop. H. J. John finds that diabetes occurs in males and females equally, and most frequently in the sixth and seventh age decades. He finds an hereditary history in only 4.6 per cent of the cases.

## HEREDITY IN DIABETES

There is an hereditary element in diabetes, but the percentage of diabetes in the descendants of diabetic persons is still so low that one cannot bar marriage.

Among a certain group of 715 diabetic children living and dead there were 31 children who had brothers or sisters with the disease. In a more recent series of 500 living diabetic children in 498 families there were 24 families in which a brother or sister had diabetic It is generally agreed that the nondiabetic brothers and sisters of persons with diabetes transmit the disease as well as diabetic persons themselves. This fact of itself makes it impracticable to forbid marriage and

the bearing of children in diabetic families.

The generally accepted view, based on experimental evidence, before the discovery of insulin, was that diabetes was due to a diminished functional capacity of the pancreatic islets. Samuel Kennedy (J. A. M. A., Jan. 24, 1931, p. 241) finds that the tendency for diabetes to run in families has been noted by medical men since early times, and he reports a family in which 10 cases occurred in two enerations.

### EXPERIMENTAL INVESTIGATIONS

Von Mering and Minkowski showed many years ago that extirpation of the pancreas in dogs was followed by glycosuria. It was known that the islands of Langerhans in the pancreas show pathologic changes in persons dying of diabetes mellitus. Many persons had attempted to prepare suitable extracts of the pancreas for use in diabetes but until the experiments of Bauting and his colleagues at the University of Toronto, no one had been able to show that an internal secretion really exists in the pancreas and that a preparation could be made from the pancreas which would have the effect of supplying the deficiency which exists in diabetes.

It had been shown by previous investigators that when the ducts of the pancreas are tied off the acinous tissue degenerates more rapidly than does that of the islands of Langerhans. In November 1920, while reading an article by Barron on the surgery of the pancreas, Dr. F. G. Banting, then assistant in physiology in Western University, London, Ontario, conceived the idea of preparing an active extract of the islet tissue. Dogs were operated on and the pancreatic ducts ligated. After suitable time the animals were chloroformed and the degenerated pancreas swiftly removed and extracts prepared from it. This extract, when injected into depancreatized animals, which ordinarily die promptly from diabetes, prolonged life by reducing the amount of sugar in the blood and aiding sugar absorption, Investigations were continued by Drs. Banting and Best under the direction of Professor Macleod, and, with the assistance of I. B. Collip, extracts were finally prepared in concentrated form from the pancreas of animals. which had the same effect as the extracts prepared from the pancreas, after tying off of the pancreatic ducts. These extracts are called insulin

### CARROHYDRATE METABOLISM

The greater part of energy is obtained from the oxidation of dextrose and other sugars derived from hydrates furnish from one half to two thirds of the ordinary diet, which after digestion are absorbed from the intestines chiefly in the form of dextrose. "Fructose and galactose are also absorbed and utilized. though in much smaller quantities." Besides the carbohydrate foods about sixty per cent of the protein and amino acids and about ten per cent of fat (glycerol) are believed to be converted into dextrose, if they are normally metabolized. Dextrose, however derived, "may be burned in the body to carbon dioxide and water, with or without an intermediate conversion into glycogen or

may be converted into fat."

Shaffer asserts that there is no longer a question that the lactic acid of muscle is formed from dextrose or glycogen, and adds that in the animal body dextrose may be converted into lactic acid or lactic acid into dextrose, Muscle, the greatest working part of the organism, metabolizes the most carbohydrate material, and lactic acid is the agent through which the energy of dextrose is transformed into heat and the work done by muscular contractions. Lactic acid is formed in the muscle "without oxygen and without the liberation of much heat, and it is during the removal of lactic acid that oxygen is consumed, heat liberated, and the greater part of oxidation occurs." There is also evidence that dextrose is transformed into lactic acid in the blood, the kidney and the liver, as well as in muscle. Shaffer finds that normal liver glycogen is transformed to dextrose and dextrose to lactic acid, and the process may be reversed; but with a diabetic liver the glycogen is transformed to dextrose and the lactic acid is transformed to dextrose.

"The sudden explosive formation of lactic acid is the essential agent causing muscular contraction." On low carbohydrate diets with hard muscular work, the fat is oxidized. In the diabetic patient, according to Shaffer, there is loss of power to oxidize dextrose, and also an inability to burn lactic acid and many of its precursors or intermediates, proved by the fact that all are completely and quantitatively converted to dextrose. The livers and muscles of diabetic animals appear to have lost the power to form lactic acid from dextrose, which suggests that the diabetic defect is in the formation of some lactic acid precursor from ordinary dextrose. He says that the failure of aceto-acetic acid (and of acetone and hydroxy butyric acid) to appear in the body is probably due to combination with a product of the oxidation of dextrose, which reaction allows its oxidation. When dextrose is not being oxidized and its ketolytic oxidation product is not being formed in sufficient amounts in relation to the rate of formation of aceto-acetic acid, the latter accumulates with resulting ketosis

Bulatao and Carlson (Am. J. Physiol., June 1924, p. 107) believe that hunger pains are due to the desire of the body for dextrose, and find that in experimental diabetes the intravenous injection of dextrose halts these gastric contractions. Lactose does not stop these pains. Dextrose will also interrupt the gastric hunger sensations after insulin treatment. It has also been found that the hunger pains of fasting are stopped by eating sugar.

A person with a normally functioning pancreas may ingest a quantity of food considerably in excess of his energy requirement and completely assimilate all that is digested and absorbed, even though the greater part of the food may be carbohydrate. An average adult, performing light work, will ingest and metabolize from 300 to 500 Gm, of carbohydrate aday. With impaired pancreatic function, the organism becomes incapable of assimilating even such quantities of carbohydrate as are contained in a general mixed diet, that is to say, a diet sufficient to cover the energy requirement in which from one half to two thirds of the total caloric intake is in the form of earbohydrate.

When there is a deficiency of the ability to assimilate carbohydrates, dextrose accumulates in the blood; and when the concentration reaches a certain limit, the excess of dextrose overflows through the kidneys. Thus, glycosaria constantly occurring in an individual whose food intake is within the limits mentioned, is evidence of diminished pancrealic function of the specific type here considered—it is evidence of dimbetes.

This statement requires some modification, for there are certain persons who pass sugar in the urine when the blood sugar concentration is normal or even below normal. The glycosuria in such cases seems to be due to an increased permeability of the kidney for dextrose. This condition of "renal diabetes" is not frequent; it is unaccompanied by the characteristic symptoms of diabetes, such as polyuria and polydipsia; the amounts of sugar excreted in the urine are seldom large, and bear little relation to the carbohydrate intake. A positive diagnosis of the condition can be made only by demonstrating a normal or low blood sugar content coincident with plycosuris.

If the food intake of a diabetic patient is diminished so as to come within his assimilative capacity, sugar excretion generally ceases. Absence of glycosuria is therefore not to be taken as evidence that diabetes is not present, unless the individual is on a full, mixed diet.

## DETECTING DEXTROSE IN THE URINE

For the detection of dextrose in the urine a very satisfactory reagent is Benedict's modification (1, Biol. Chem., vol. 5, 1909, p. 485) of Fehling's solution, since it is very sensitive to dextrose. Unlike the original Fehling's solution, it does not react with a number of normal and accidental urinary constituents. The reduction test, if slight, should be confirmed by the fermentation test.

## PROTEIN AND FAT METABOLISM

In diabetes, there is a lowered functional capacity, not only for the assimilation of carbohydrate, but also for protein, since the latter food may yield a considerable amount of its starch.

In diabetes the metabolism of fats is disturbed since, as Naunyn has expressed it, "fats burn in the fire of carbohydrates." With failure to assimilate carbohydrates the "fire" may be but a smoldering one, so that fats are incompletely burned with the formation of acetone, aceto-acetic acid, and beta-oxybutyric acid. The latter two substances, being acids, may, if produced in sufficient amounts, lead to a serious disturbance of the acid base equilibrium of the body, known as acidosis. It is acidosis that is presumably the cause of diabetic coma.

### OBJECT OF DIETARY TREATMENT

The object of the dietary treatment of diabetes is to supply a diet that can be metabolized and that will not overtax the weakened carbohydrate metabolism. Allen has aptly compared the functionally weak pancreas to a "weak" stomach. If the latter, with frequent rests, is supplied with food of such quality and such quantity as can be readily digested, it may function satisfactorily, and may even be able to digest larger and larger amounts of food, although it will never become a "strong" stomach. Continued dietary insults, on the other hand, would further weaken the organ. The same holds true for the functionally weakened pancreas; it may be able to provide for the assimilation of a certain amount of food, but if overwhelmed with an amount in excess of its capacity, a progressive diminution in capacity results. A weak stomach if overtaxed usually gives warning by discomfort; an overtaxed pancreas gives no warning.

## COMBINING INSULIN AND DIETARY TREATMENT

The diabetic person who constantly indulges in food in excess of his assimilative capacity invariably becomes worse; hence the frequent belief that diabetes is characterized by an inherent downward tendency. As a matter of fact, practically every diabetic patient has some tolerance for starch, which is usually sufficient to allow for a great enough starch intake to cover the basal energy requirements. With proper treatment, it is possible to maintain or even to increase this tolerance.

Insulin allows the dextrose to be converted into its active form. The blood sugar remains at normal level, when the dose of insulin is correct, the urine remains free from sugar and the fat is completely burned, as acetone bodies disappear from the urine. In other words, normal metabolism is restored. Insulin, however, can not replace the dietetic treatment of diabets.

### DETERMINING TOLERANCE

Gladys Boyd (Am. J. Dis. Child., March 1925, p. 329) reminds us that we must note, in arranging a diet for diabetic patients, that every 100 Gm, of protein may yield 58 Gm. of dextrose during its metabolism. while 10 per cent of the fat in the form of glycerol is to be regarded as carbohydrate. Therefore the total carbohydrate intake of a patient consists of 100 per cent of the carbohydrate plus 58 per cent of the protein plus 10 per cent of the fat. She quotes Shaffer as concluding that one molecule of dextrose is capable of oxidizing two molecules of fatty acids. However, many believe that the ratio of fat to dextrose should be as 1 to 1. Joslin maintains that when the urine is sugar-free and the protein does not exceed 1 Gm. per kilogram of body weight, three times as much fat as carbohydrate may be given.

Boyd believes that for children a starvation of one day is sufficient, and if the blood sugar is high insulin should be given. But little fat should be given with a low diet, and the final diet is determined by the child's nutritional needs and not by its tolerance. Enough insulin should be given to take care of the food he needs above his sugar tolerance. Calcium lactate in large doses has been found to cause some reduction in the amount of insulin required. Boyd emphasizes the necessity for removing every focus of infection and of having the child lead a careful, restful life, with

avoidance of fatigue.

Joslin (J. A. M. A., Jan. 1, 1927, p. 28) warns against beginning a starvation diet too suddenly, and especially when there are symptoms of impending coma. He also urges that in acidosis one should treat the diabetes rather than depend entirely on alkali.

Insulin cannot replace wholly the dietary treatment of the disease. As all patients with diabetes are capable of taking care of some carbohydrate, the degree of injury to the islands of Langerhans may be estimated by determining the patient's tolerance for carbohydrate. On the basis of animal experimentation and carefully controlled clinical observations, Allen demonstrated that the urine of patients with diabetes may be freed from sugar by fasting and by carefully controlled clieting. Following a preliminary fast, patients are given

gradually increasing amounts of carbohydrate, beginning with green vegetables as shown in the following tables and then gradually adding small amounts of protein and fat. The urine is frequently tested for the appearance of sugar which is taken as an indication that the sugar requirement has been exceeded. The amount of food is lowered, or the patient may fast a day, and than one-half the amount of carbohydrate is given and the attempt to ascertain the tolerance again begun at this level.

The majority of diabetic patients may fast until the urine is sugar free without developing any untoward symptoms or complications. Exceptionally marked prostration, nausea, increasing drowsiness and deep breathing (azyanotic hyperapnea) may ocur. These are symptoms referable to acidosis, and occur coincidentally with alterations in the composition of the blood, alveolar air and urine. With the appearance of a severe and progressive acidosis, the fast must be terminated and the treatment directed against the acidosis. The therapy of this condition will be discussed later.

## ESTABLISHING CARBOHYDRATE TOLERANCE

The accompanying table, compiled by Joslin, contains in a compact form all essential information for the establishing of carbohydrate tolerance. The figures, although only approximate, are sufficiently accurate.

A convenient scale for weighing food is a movable

dial spring balance.

Feeding is begun with food containing only small amounts of carbohydrate and lesser amounts of protein and fat. The most satisfactory diet to begin with is one composed exclusively of green vegetables of the "5 per cent group" (see table). These vegetables, although they contain but little available nutriment, have a large bulk and serve to fill the stomach, thus allaying in some measure the pangs of hunger. The indigestible residue is valuable in preventing constipation. From 150 to 200 Gm. of the vegetables of this group are given the first day. Approximately 5 Gm. of available carbohydrates are contained in this amount. If no glycosuria occurs, the diet on the second day may contain vegetables equivalent to five more grams of carbohydrate, and this increase is made daily until

### JOSLIN'S DIET TABLE

Strict Diet-Meats, Fish, Broths, Gelatin, Eggs, Butter, Olive Oil, Coffee, Tea and Cracked Cocca

FOODS ARRANGED APPROXIMATELY ACCORDING TO PERCENTAGE OF CARBORYDRATES

#### Vegetables

		tables	vege	
20 Per Cent	1 :	15 Per Cent	10 Per Cent	5 Per Cent
cotatoes chell beans aked beans reen corn boiled rice boiled maca- roni	S	Gren pess Artichokes Pariships Canned lima beans	onloss Squash Turnip Carrots Beets String beans Pumpkin Kohirabi Green peas, canned	Lettuce Spinache Spinache Spinache Spinache Spinache String beans, canned Celery Celery Sorrel Endive Endiv
			canned	Sorrel Endive Dundelions Swiss chard Ses kale Tomatoes Rhubarb Egg plunt Leeks Beet greens Watercress Cabbage

#### Frank.

Fruits				
Ripe ollves (20 per cent fat) Grapefruit	Letnons Oranges Cranberries Strawberries Blackberries Gooseberries Peaches Pincapple Watermelon	Apples Pears Apricots Blueberries Cherries Currants Raspberries Huckleberries	Plums Bananas Prunes	

Nuts

Butternuts Pignolias	Brazil nuts Black walnuts	Almonds Walnuts (Eng.)	Peanuts
Pignonas	Hickory Pecans	Beechnuts Pistachios	40 Per Cent
	Filberts	Pinenuts	Chestnuts

Miscellancous. - Unsweetened and unspiced pickles, clams, oysters, scallops, liver, fish roe Reckon actually available earbohydrates in vegetables of 5 per cent group as 3 per cent, of 10 per cent group as 6 per cent

Thirty Gm., or 1 ounce, of each of the following contains approximately:

	Protein, Gm.	Fat, Gm.	Carho- hydrates, Gm.	Calo- ries
Oatmeal, dry weight	5	2	20	120
Shredded wheat	23	š	0	104
Unceda biscuits, two	10	ĭ	1	53
Oysters, six	4	ê	1	49
Chicken, cooked, lean.		8		59
Cheese	0		11	131
Officer		ñ	30	270
Fish (cod. haddock) cooked	0	6	30	24
Broth	0	9.7		3
Meat (uneooked)			. 0	50
Meat (cooked)		3 5		
	8		. 0	75
Broth	0.7	9	0	3
Potato			6	30
Bacon (cooked)	5	15	0	155
Cream, 40 per cent	1	12	1	120
Cream, 20 per cent	1	6	1	60
Miik	1	1	1.5	20
Bread	3	0.5	18	90
Butter	0	25	0	225
Egg (one)	6	6	. 0	75
Brazil nuts	5	29	2	210
Orange (one)	0 .	6	10	40
Grapefruit (one)	θ	0	10	40
Vegetables, 5 and 10% groups	0.5	9	1	6

<sup>1</sup> Gm. protein, 4 calories. 1 Gm. fat, 9 calories.

<sup>0.25</sup> Gm. protein contains 1 Gm. nitrogen.
30 grams (Gm.) or cubic centimeters (cc.), 1 ounce.
A patient "at rest" requires from 25 to 30 calories per kilogram body weight.

I Gm. carhohydrate, 4 calories. I Gm. alcohol, 7 calories. I kilogram, 2.2 pounds.

20 Gm. of carbohydrate are given. Following this, 5 Gm. are added every other day until glycosuria occurs or the patient is receiving as much as 3 Gm. of carbohydrate per kilogram of body weight in twenty-four hours ([oslin). After the first day or two carbohydrate may be given in the form of vegetables of the 10 per cent group, followed subsequently by those of the 15 and 20 per cent groups. Fruits are then added, and ultimately, if glycosuria has not supervened, bread and oatmeal.

Vegetables are best cooked by steaming in a double boiler, as in this way vitamins and minerals are not

lost.

Ordinary bread is seldom included in the dietary of the diabetic. There are on the market a large number of brands of "gluten" and "diabetic" flour which contain relatively little carbohydrate and much protein. Bread made from such flour, provided the composition is accurately known, is satisfactory. These special brands of flour, however, are expensive and many are fraudulent.

The patient's longing for bread may, in a measure, be satisfied by bran biscuits. These do not contain any carbohydrate and serve as a convenient vehicle for the administration of butter or other fats. The bulky residue fills the stomach and relieves constipation.

The	recip	e used	at the	Rockefetter	Institute	Hospit	at is:
	Bran					60	Gm.
	Agar.	agar.	powde	red		34	teaspoonful
	Cold	water				100	cc. (1/2 glass

The bran in cheese cloth and wash under cold water tap until water is clear. Mix agar-agar in the water (cold) (100 cc.) and bring to the point of boling. Add to washed bran the sait and agar-agar solution (but). Mold fine three cakes. Flace in pan and, when firm and cold, bake in moderate oven from forty-fire to fifty minutes.

The appearance of dextrose in the urine signifies that the patient's assimilative limits have been exceeded. A fast must be instituted until the glycosuria ceases or insulin may be given to control this symptom.

Unfortunately one of the results of too greatly restricting the diet of the diabetic patient is to produce under-nutrition, a marked loss of weight and strength, a tendency to infection, and an early death. The discovery of insulin has made it possible to feed the patient more efficiently, to forego fasting, to combat acidosis

and coma, and to prolong remarkably the life of the

diabetic person.

It is possible to begin the treatment of even severe cases with a palatable diet of protein, fat and carbohydrate in adequate quantities to meet the requirement of the body at rest in bed or with moderate exercise, and at the same time to afford adequate rest for the injured islands of Langerhans. As pointed out by the Insulin Committee, after the glycosuria and ketonuria have disappeared and the blood sugar level has returned to normal, the diet may be gradually raised until the patient is receiving sufficient food to maintain the body weight slightly below normal, and until sufficient calories are being supplied for the body to perform the ordinary duttes of life.

Recently attempts have been made to vary the diabetic diet by introducing such substances as levulose, Jerusalem artichokes and honey. The use of levulose in diabetes has been studied rather completely by Joslin and his associates in Boston, and there is still considerable dispute as to its action in this disease. One thing seems to stand out, that although levulose is well borne at first, hyperglycenia and glycosuria soon make their appearance. The details of the various experiments may be found in Joslin's "Treatment of Diabetes Mellius" (ed. 4. Philadelphia, Lea & Febirer.

1928, p. 619).

The same group has studied the effect of Jerusalem artichokes, the composition of which is the same as that of other artichokes. This vegetable contains approximately 16 per cent of carbohydrate, chiefly inulin, which on hydrolysis yields levulose. These workers show that Jerusalem artichokes could be added to the diabetic diet. Joslin pointed out that it was possible to substitute 15 Gm. of carbohydrate from Jerusalem artichokes for 5 Gm. from 5 per cent vegetables, but has cautioned that a small dosage should be used to avoid the danger of gastric upset. Experiments in which varying quantities of dried artichokes and inulin were used in the diet of a diabetic patient were reported at a meeting of the American Chemical Society and the conclusion reached was that Jerusalem artichokes are of doubtful value as a source of carbohydrate for these patients.

The information available does not show that honey is as rich in vitamins A and B as is orange. In food value the same amount of honey contains approximately six times as much carbohydrate as is found in an orange.

It is no longer necessary to cause dangerous acidosis by starvation. If serious acidosis occurs, insulin should be administered and carbohydrate given. If it is advisable to cause considerable acidosis by starvation, sodium bicarbonate is the best antidote, and 4 Gm (60 grains) given by mouth at from four to six hour intervals is an effective dose. The intravenous administration of sodium bicarbonate solutions (500 cc., or 1 pint, of a 4 per cent solution) injected slowly is often the most efficient method of realkalizing they system.

P. A. Gray and W. D. Sansum (J. A. M. A., May 20, 1933, p. 1580) treated 1,005 patients with diabetes mellitus with a higher carbohydrate diet method. Arterioselcrosis was the chief single cause of death in these patients. The incidence of arterioselcrosis seemed to be more closely related to the age of the patient than to the duration of the diabetes. An improvement in sugar tolerance as measured by either an increased diet or a reduced insulin dosage was found in 42 of 70 cases in which this diet was used for seven years continuously. All patients reported a sense of increased well being and physical fitness.

## INDICATIONS FOR INSULIN

At the beginning of treatment, all patients with diabetes mellitus, excepting those suffering from sever acidosis and coma, should be put to bed and given a basal maintenance diet. This diet contains protein sufficient to replace the daily wear and tear of the tissues of the body, approximately 0.3 Gm. per pound of body weight. Additional calories in the food are supplied by carbohydrate and fat in proper proportion to prevent the production of acetone bodies, and in adequate amount for the height, weight and sex of the patient. If the urine becomes free of sugar on this diet, the quantities are gradually raised until the patient is receiving an adequate diet for the amount of work he ordinarily does. Should he remain without sugar in the urine on this diet, insulin treatment need not be given, and it is the belief of the Insulin Committee that approximately 75 per cent of diabetic persons will fall in this class. If, however, at the end of a week's treatment on a basal diet, the urine is not free of sugar, the patient requires

insulin.

Joslin has outlined a series of Insulin Diabetic Diets (J.A.M.A.J., June 2, 1923, p. 1581) which are a valuable guide to beginning treatment with the extract. "Fasting." he says, "is practically neven necessary for even one meal, since generally the patient becomes sugar free on Test Diet 3 or 4. Then one skips to that maintenance diet which has about the same quantity of carbohydrate, and advances each day. If sugar returns, for instance, on the carbohydrate and protein and fat for the sixth day  $(C\ 6$  and  $P\ F\ 6$ ) and the patient is not receiving enough calories, one lowers the diet to  $C\ 5$  or  $C\ 4$  and advances the proteins and fat to  $P\ F\ 7$  or  $P\ F\ 8$  or more as needed, or even adds extra fat in the form of cream or butter."

According to Joslin's method, the first dose of insulin should be I unit. This is the amount necessary to lower the blood sugar of a 1 Kg. rabbit, fasting twenty hours, to 0.045 per cent. He points out that it is safer to begin with 1 unit because a larger dose may bring down the blood sugar too rapidly and produce symptoms of hypoglycemia which will be discussed later. The amount of insulin is gradually increased up to the patient's requirement in relation to the amount of food that he is receiving. Once the patient is sugar free the attempt is made to eliminate one dose daily of insulinthe noon dose-by shifting the carbohydrate in his diet toward the morning and evening. The time at which the insulin is given varies from one-quarter hour to one and one-half hours before meals, depending on the rapidity of absorption of the carbohydrate from the stomach and of the insulin from the subcutaneous tissues. The insulin is injected subcutaneously in the arm. thigh or buttock. The average dose of insulin given daily in Joslin's clinic was 11 units.

Wilder of the Mayo Clinic (Endocrinology, September 1924, p. 630) finds that one unit of insulin, injected subcutaneously, allows an increased tolerance for sugar ingestion of about 2 Gm. Besides the need for extra

insulin when an infection attacks a diabetic person, more is also needed in pregnancy and in hyperthyroidism.

In coma the diabetic patient is saturated with unused sugar, and Wilder finds that the blood usually contains more than 0.5 per cent of sugar, and says that "it is highly probable that the tissues often contain more than 200 Gm." At the Mayo Clinic he says that ketosis is generally controlled by an amount of insulin that does not exceed 100 units. In certain conditions of infection, and in hyperthyroidism, it may be necessary to give 100 units of insulin, daily, for a time to prevent acidosis. He notes, as have others, that diabetic patients may vary greatly from time to time in the amount of carbo-budgates they can tolerate without glvcouria.

H. J. John (Am. I. M. Sc., July 1926, p. 96) says that the reaction of insulin injections varies in the same and in different patients and does not bear any uniform relation to the size of the dose or to the blood sugar level. The time of reaction also varies from immediately to several hours, and even an exceedingly large.

dose may not cause a reaction.

## USE OF INSULIN IN COMA

Nellis Foster (J. A. M. A., March 7, 1925, p. 719) reminds us that many of the symptoms of diabetic coma and acidosis are due to dehydration which is caused by excretion of large amounts of urine, by vomiting or diarrhea, and by drowsiness, which prevents the patient from realizing his thirst and need for water. Also, the rapid breathing of acidosis increases the loss of water. The tongue and mouth become parched, the skin shrivels, and the whole circulation is impaired from the concentration of the blood. On the other hand, with the weakened heart condition Foster cautions against too rapidly increasing the volume of the blood; he believes that intravenous transfusions of saline or sodium bicarbonate solutions are not advisable, and that the best treatment is to give physiologic sodium chloride solution by hypodermoclysis or, perhaps in children, by injections into the peritoneal cavity. The amounts of the saline solution thus given should not be too great, as it is safer to repeat the injections.

Foster believes that in coma insulin should be given intravenously, associated with the administration of dextrose, and advises from 20 to 25 units of insulin. every two hours, until the urinary sugar begins to fall; then for a time he would discontinue the injections. The blood sugar percentage and the sugar in the urine should be repeatedly noted as indicators of the amount of insulin to use. While caffeine or strophanthin given hypodermically may be needed, the dextrose will generally act as a heart stimulant. If the dextrose is given intravenously it must be pure; it comes in prepared capsules. As soon as the patient can swallow he advises hot broth or black coffee, two or three ounces at a time. Later, orange juice may be retained. After twentyfour hours he advises the diet of a quart of milk and the juice of ten oranges, which will represent about 1.000 calories

Janney and Shapiro (Arch. Int. Med., July 1926, p. 96) find that the seat of insulin activity is in the tissue cells of the entire body, and that during insulin activity large amounts of destroace destroace activity large amounts of destroace and the activity large amounts of the state of carbod that content of the state of the state

The treatment of coma, threatened or actual, is the same as it has always been with the exception that insulin must be given in large doses, and as early as possible. While there is no set method to gage the dosage of insulin, it is generally agreed that the initial injection should be from 20 to 40 units, which should be repeated every hour or two according to the condition of the patient. In addition, all the accessory therapeutic factors which Joslin summarizes in his texthook should be employed. The patient should be kept warm, an enema should be given, fluids should be administered in large smounts, and the heart must be sustained. The most important fact to be emphasized is the necessity for quick and continued action.

Insulin Diabetic Diets

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## INSULIN HYPOGLYCEMIA

Venous blood has a lower sugar content than arterial blood, and the difference between the two is increased when enough sugar is ingested to cause a hyperglycemia. Cori and Cori (Am. J. Physiol., February 1925. p. 688) have found that in normal persons there is an average of 0.005 Gm. of sugar per hundred cubic centimeters of blood less in the cubital vein than in the arterial blood of the fingertip. After injections of insulin, this difference is three times as great. Also, in diabetic patients who are receiving insulin, the difference between the sugar content of the arterial and venous blood is greater than if they have not received insulin. Major and Davis (J. A. M. A., June 13, 1925, p. 1798) note that there is no fixed level of blood sugar at which sugar will appear in the urine, and that the renal threshold may vary in the same person from time to time. They also find that the blood sugar may be high without sugar appearing in the urine

Williams (Boston M. & S. J., Jan. 22, 1925, p. 163) notes that when glycosuria begins in the latter half of pregnancy, it is usually physiologic and disappears after delivery. He explains turther that it is a renal glycosuria and is not accompanied by an increase in blood sugar, and that it can be differentiated from diabets by a study of the blood sugar. He believes that this physiologic glycosuria is due to the normal hypertrophy of the posterior lobe of the pituitary during pregnancy, and that after pregnancy when it returns to normal the glycosuria will cease. This sugar of pregnancy is always dextrose, he saws, while lactose may anotear.

in the urine during lactation.

When an overdose of insulin is given in relation to the amount of carbohydrate taken in the diet, and the blood sugar falls below 0.07 per cent, a characteristic train of symptoms results. The patient may first complain of hunger or, more often, of a sense of weakness or fatigue; especially if it is his first reaction, he is conscious; of some anxiety or of what he calls nervousness. He may even show signs of a definite neurosis, with a loss of emotional control, such as crying spells. Almost constantly present is a feeling of tremulousness, but actual tremor is rarely seen. The patient may also have some incoordination of finer

movements. Vasomotor phenomena, such as pallor or flushing, a sense of heat, of chilliness, or a profuse sweat are common. Should the hypoglycemia increase and the lowering of the blood sugar come to 0.05 per cent there is an acute distress or mental disturbance, such as confusion and disordentation. Finally, a blood sugar of 0.032 results in a state of coma with hypotonia and loss of the deep reflexes. The temperature falls rapidly but on the administration of dextrose it immediately rises again. Patients suffer difficulties with articulation when the blood sugar reaches the lower levels mentioned.

Fortunately these serious symptoms may be relieved by the immediate administration of food. From 50 to 100 cc. of orange juice has an almost immediate effect in clearing up the symptoms. A better result is obtained with from 5 to 25 Gm, of dextrose given with orange or lemon juice. "When a patient is unconscious," says Banting, "1 cc. of epinephrine (1:1.000 solution) should be given intramuscularly followed by dextrose by mouth, and if the patient is not well enough in a few minutes to swallow dextrose, it may be given intravenously or subcutaneously." Special nursing precautions should be adopted for the detection of reactions when insulin treatment is first started, when a new preparation is being given and when insulin is administered late in the day, as the reaction may occur during sleep. The patients soon recognize the state of a reaction, and may be able to avert the symptoms of their own accord.

Patients with mild cases, by dieting, or after the establishment of equilibrium by insulin treatment, will do well on the diet found to fit them,

In severe cases of diabetes insulin must be given daily for the tolerance of carbohydrates and proteins necessary for the maintenance of weight and of strength for work.

The insulin therapy, until the dose and action on the individual patient is ascertained, should be carried out in a hospital.

## ALLERGIC INSULIN REACTIONS

Insulin is a protein-bearing compound in which the protein fraction is reduced to a minimum. Allergic

reactions to the fissulin apparently occur quite frequently. Many diabetic patients exhibit evidences of hypersensitivity to insulin in local skin reactions which are seldom of serious importance and may easily be corrected by the oral use of calcium lactate. John R. Williams (J. A.M. A., A., Phyril 12, 1930, p. 1112) says that more serious allergic reactions involving other parts of the body occasionally occur, and he records an almost fatal reaction involving the gastro-intestinal tract. He suggests that those charged with the responsibility of treating diabetic patients bear this phenomenon in mind and that patients be instructed accordingly.

Insulin reactions, even of moderate severity, are in some instances definitely injurious to the diabetic patient. A fair amount of literature has been accumulated showing that in older diabetic patients, particularly, insulin reaction may produce attacks of angina pectoris and even of coronary thrombosis. It has been shown also that the therapeutic use of insulin in this type of case is not without danger. However, it is a rather interesting observation that even very low. blood sugar in the human body rarely leads to death. We know of no evidence proving that mild insulin reactions stimulate the pancreas and are of benefit to the patient.

#### EXERCISE

Fitz and Murphy (Arch. Int. Med., September 1924, p. 402) find that the strength of diabetic patients is always below normal, but that it may become normal by proper diet and physical therapy. The caloric value of the diet seems to be the main point in developing strength, not necessarily any particular food factor. They find that muscular exercise properly supervised is of benefit to these patients. They deplore undernutrition for more than a day or two, although of course diabetic patients should not be fattened rapidly with insulin and high calory diets. Such treatment will not aid them physically. It is better for them to gain weight and strength more gradually, and to remain thin and strong rather than fat and week.

Exercise forms a valuable adjunct in the treatment of diabetes. It serves to raise the carbohydrate tolerance and to build up active protoplasmic tissue at the expense of fat. In addition, the patients who exercise feel better and take more interest in life. The appetite is increased, but not more than the increased assimilative power. Allen advises active exercises for practically all diabetic persons. Strong patients may begin exercise during the pre-liminary fasting period; weaker ones, during the period of deting. It is especially advantageous immediately following a meal containing carbohydrate. Short periods of vigorous exercise are preferable to long continued monotonous walks. The patient should stop just short of uncomfortable fatigue. In children, exercise is of especial benefit, as it aids in the building up of muscular tissue and favorably influences growth.

#### ACIDOSIS

In the course of diabetes mellitus, large amounts of the "acetone bodies," namely, acetone, aceto-acetic acid and beta-oxybutyric acid may be produced. These substances, for the most part, are products of the incomplete combustion of fats, and appear when there is a disproportionately great metabolism of fat as compared with carbohydrate. For the complete combustion of fat, it seems essential that a certain amount of carbohydrate be simultaneously burned. Under the older methods of treatment the production of large amounts of the acetone bodies at some stage of the disease was usual, and, as a result, a large proportion of all diabetic persons, and especially younger patients, ultimately developed coma-presumably as a direct result of overproduction of the acetone bodies. By strict adherence to the rules of treatment already formulated, it is usually possible to reduce the production of acetone bodies to a minimum.

For an indication that acetone bodies are present in the urine the simplest test for the general practitioner is the ferric chloride test. A 5 per cent solution of ferric chloride in water when added to urine will cause a precipitate with a distinct purplish discoloration, if aceto-acetic (diacetic) acid is present. If salicylates have been taken by the patient, a similar reaction will occur. If this purple color is due to a salicylate, and the urine is boiled for a few minutes, the discoloration will persist, while if it is due to aceto-acetic acid it will disappear. This test for the presence of acetone bodies in the urine is sufficiently delicate for all ordinary purposes.

Appel and Cooper (Am. J. M. Sc., February 1927, p. 201) find that a patient may be in a serious acidemic condition and still at times there may not be any reaction for diacetic acid in the urine when ferric chloride.

is added.

Of the acetone substances, acetone itself is an adventitious decomposition product of aceto-acetic acid. and is probably never formed in sufficient quantity to do harm. Aceto-acetic acid and beta-oxybutyric acid. however, are fairly strong acids, and for that reason are capable of doing much harm to the organism by the neutralization and removal of the available bases. Acids of one kind or another are always being produced in the course of metabolism, and the body possesses an efficient mechanism whereby these acids may be neutralized or excreted. A slight excess in acid production, such as a few grams of beta-oxybutyric acid, can be completely compensated. With a larger production of acids, especially if continued over a considerable time, the compensatory mechanism of the body may become overtaxed, with the result that an actual depletion of the alkali reserve of the body fluids and tissues occurs. Such a condition is known as acidosis. In diabetes, the appearance of acetone bodies in the urine signifies that the ideal result of treatment has not been attained, but it does not necessarily mean that acidosis is present. Qualitative tests alone on the urine are not sufficient either to confirm or to exclude acidosis, as a strong test may be obtained when no acidosis is present, and only a faint reaction at the height of the coma of acidosis.

A high excretion of ammonia in a twenty-four hour specimen of urine is an indication of abnormal activity on the part of the defensive mechanism of the body, and is a warning signal. Among the symptoms of incipient acidosis are indefinite malaise, headache, slight nausea and neuralgic pains. In other words, they are extremely variable. Certain symptoms, as increasing drowsiness and deep breathing of the "air

hunger" type (acyanotic hyperpnea), may indicate to the skilled observer the onset of acidosis; but for an accurate quantitative idea of the degree of acidosis determinations on the alveolar air or blood must be made

Not infrequently acidosis has been supposed to be the condition that was causing symptoms when actually they were due to alkalois. If alkali is not well excreted, the sodium bicarbonate treatment may precipitate alkalosis, even if the dose given is not large or excessive. Doubtless, frequently in acidosis too much sodium bicarbonate is given. It has been found that ketonuria may be present and yet acidosis may not be the cause. To make a positive diagnosis of alkalosis a careful laboratory study of the blood is required.

#### ALVEOLAR AIR

In acidosis, there is a diminished carbon dioxide tension in the alveolar air of the lungs. The determination of this tension is a simple bedside procedure. Marriott described a rapid clinical method for the purpose, for the details of which the reader is referred to the original paper (J. A. M., A., May 20, 1916, p. 1594). It is important that the degree of acidosis be known, especially during the fasting period, since failure to recognize a progressive acidosis may result in serious or even fatal consequences.

The carbon dioxide combining power of the blood plasma as determined by the Van Slyke method is probably the method of choice in determining the degree of acidosis. This test can be easily performed in any good laboratory. It requires special apparatus and a little more than ordinary terbnical skill

## ALKALI THERAPY

Dietetic treatment usually will prevent the formation of acetone bodies and is the rational therapy for acidosis. Occasionally, however, the acidosis may become of such a grade that the administration of alkali is required. Alkalis neutralize acids already produced and replenish the depleted alkali reserve of the body, but have no effect in inhibiting the production of acids. Alkali administration is merely a temporary means of checking acidosis, but a valuable procedure when acidosis is of a severe enough grade to threaten life. Alkali therapy should not in any only to tide the patient over a critical period. It is indicated when, as a result of the patient's failure to observe dieteic regulation, the alveolar carbon dioxide tension has fallen to 20 mm. or lower, or if coma is present, or obviously impending, and also when, as a result of fasting, progressive acidosis occurs which is not promptly checked by feeding green vegetables.

Alkali in the form of sodium bicarbonate may be administered by mouth, by rectum, intravenously or subcutaneously. The amount necessary is determined by the degree of acidosis, the size of the patient, and the therapeutic result obtained as gaged by a rise in carbon dioxide tension and by symptomatic improve-

ment.

Sodium bicarbonate in solution may be given by mouth. In adults, it is usually futile to give less than 4 Gm. at a dose, which may be repeated every four or five hours. Doses larger than 15 Gm. are generally not well tolerated. Alkali should be continued until the alveolar carbon dioxide tension has risen above 30 mm.

By rectum, the drop method should be utilized, equal parts of physiologic sodium chloride and 4 per cent

sodium bicarbonate solutions being given.

Many diabetic persons, especially those approaching coma, are unable to retain alkali when given by mouth, on account of nausea and vomiting. In such instances, and in all serious cases in which alkali is required, intra-venous injection is the method of choice. A 4 per cent solution of sodium bicarbonate may be used and as much as 500 cc. injected, slowly, at a time. The injection may be repeated as often as indicated by the observations of the alveolar air or by the symptoms. Since boiling changes bicarbonate into carbonate it is necessary to have the bicarbonate solutions specially prepared either by filtration through porcelain filters or by using chemically pure bicarbonate in sterile water or physiologic sodium chloride solution.

The administration of insulin simultaneously causes utilization of carbohydrate and from 600 to 800 calories may be given in the form of eggs and lean meat.

## INDIVIDUALIZATION OF THE DIABETIC PATIENT

Diabetic patients wary greatly not only in their ability to metabolize food without the appearance of sugar but also as to the factors which may produce symptoms of acidosis. Likewise diabetes may be complicated by other constitutional diseases, such as tuberculosis and syphilis, and it is a delicate problem to determine how far one may go to influence one condition favorably without producing great harm as related to the other.

From what has been written it is quite apparent that the treatment of diabetes requires special knowledge and constant and intelligent care. Focal infection, if present, must be removed. Mouth infection may be a cause of glycosuria. The disease is combated only by management of the diet, which requires as fine discrimination in its use as to both quantity and quality as does any drug, and by the proper administration of insulin. Cooperation on the part of the patient is another requisite. When proper care and satisfactory cooperation can be obtained, the results are usually

satisfactory.

Fitz and Murphy (Am. J. M. Sc., September 1924. p. 313) studied 64 fatal cases of diabetes and found the causes of death to be: coma, with or without terminal infection; sepsis; cardiovascular-renal disease (including gangrene), and pulmonary tuberculosis. The younger patients die of coma and pulmonary tuberculosis, while the older ones die of cardiovascular-renal disturbance or sepsis. They found that leukocytosis is generally present in severe acidosis and that anemia is a serious complication. They believe that the prevention of coma is largely a matter of education. All diabetic patients must be taught not only to keep the urine sugar-free, but also to balance their diets so that acetone bodies are not formed. They must also realize that even a minor ailment may be serious, and that they should call medical aid as soon as they are ill. A working rule should be that if a diabetic person feels ill, he should go to bed, take an enema, drink plenty of water, take orange juice and gruel, and, if not rapidly improved, send for his physician,

Diabetic coma may be difficult to diagnose, but the accompanying symptoms are subnormal temperature, rapid pulse, low blood pressure, dry skin and more or less dyspnea. Sugar is almost invariably found in the urine, and albumin and casts may be found. Acetone and diacetic acid are generally present, though Fitz and Murphy say they may be absent from the urine. The breath smells of acetone, and there is generally some nausea, womiting, abdominal cramps, restlessness and air hunger. A patient may be in diabetic coma and yet a previous history of diabetes may not be obtainable.

Especially may this occur in young persons.

These authors urge that a diabetic person must be cautioned not only against skin infections but against chronic dental and other focal infections. Such persons must beware of overwork, of extra worry, and of becoming chilled. While gangrene is common. it is unnecessary and the condition may be prevented. They quote Joslin's rules for the treatment of the feet, in which gangrene so frequently occurs. The feet should he washed daily with soap and water, dried thoroughly, especially between the toes, and when thoroughly dry should be rubbed with hydrous wool fat to keep the skin soft and free from scales and dryness. Proper shoes should be worn; there should not be any rubbing or friction. The slightest injury to a foot and any injury to the skin requires immediate treatment. Irritating applications should not be used, and corns and calluses should be carefully treated. Joslin suggests 4 Gm. of salicylic acid in 30 cc. of collodion applied to a corn every night for four nights, and then "after soaking the feet with warm water the corn will come off easily." Corns and callosities should not be cut. If the feet are subject to chilblains, he advises washing them carefully every day with warm water, drying them, and then powdering with borated talcum powder and massaging with hydrous wool fat.

#### DIABETES IN CHILDREN

Frank N. Alian and Russell M. Wilder studied the cases of 167 children treated for diabetes. Seventeen of these children treated for diabetes. Seventeen that in all the cases under consideration with the exception of 2 or 3, that death occurred from preventable causes. These were failure to receive insulin, improper use of insulin along with carclessness in delting, depend-

ing on defective Benedict's solution and inexpert medical supervision.

## COMPLICATIONS AND SEQUELAE

It should be remembered that a generalized and persistent furunculosis (often due to coincident mouth infection) may be an umpleasant accompaniment of diabetes. Diabetic gangrene is another condition which may appear in the course of this disease and necessitate operation. Operations on diabetic persons, previous to the discovery of insulin, were notoriously dangerous and were usually undertaken only when deemed a life-saving measure. Under insulin treatment anesthetics are well tolerated and patients can be properly prepared for operation.

Generalized itching of the skin in elderly persons with diabetes is comparatively rare and is sometimes exceedingly difficult to control. The usual procedures, such as calamine lotion, keeping the skin well oiled, may be of no avail, in which case therapeutic roentgen rays may be tried. There are two suggestions that may be made: (1) to see whether the treatment of the patient with a lower diet and no insulim might be of some effect and (2) to have a basal metabolism test done. If the test shows a minus rate, thyroid in

therapeutic doses at times alleviates itching.

As is well known, when pyogenic infection complicates diabetes, mild cases become quite severe, and patients often pass into coma before they come under suitable treatment. As Olmsted and Kahn report (J. A. M. A., June 30, 1923, p. 1903), by the use of insulin in such cases, the blood alkali may be restored to normal, and carbohydrate may be administered before the necessary operative procedures are carried out, After such crises, the patient's tolerance may be improved to such a degree that insulin may not be required. When a diabetic patient is operated on, they have found it a useful procedure to give from 20 to 25 Gm. of dextrose an hour or two before operation, and at the same time a dose of insulin, which causes the burning or storage of this sugar. The evaluation of this dose is based on the assumption that I unit of insulin stimulates the burning of 1.5 Gm. of dextrose. If the patient is to be operated on in the morning the usual dose of insulin is added to the dose calculated

to burn the extra dextrose.

H. Friedenwald (J. A. M. A., Aug. 8, 1925, p. 428) discusses diabetic retinitis and says that it is usually punctate. It may occur as retinitis punctata centralis, which is suggestive of diabetic origin, though nephritis may be the cause. Punctate retinal hemorrhages are found, but large hemorrhages are rare. Major and Curran (J. A. M. A., Feb. 28, 1925, p. 674) declare that, though rare, diabetic cataract may occur in children. Many other inflammations and disturbances of the eves may sesult from diabetes besides retinitis.

#### CONCLUSION

The adult diabetic patient who is treated with insulin compares favorably with the normal person except that the majority have the subjective impression that they are not capable of normal physical effort without fatigue. Children apparently do not show even this limited. The proposition of the most important factors in obtaining good results.

Priscilla White (J. A. M. A., Oct. 18, 1930, p. 1160) notes that studies of the diabetic child have taught lessons of great importance. First, heredity is an undoubted etiologic factor in diabetes; second, overnutrition is a precursor of diabetes, and third cataracts and arteriosclerosis can occur in diabetic patients under the age of 20. On the other hand, the possibilities of combating the taint of heredity and an environment producing maximum growth are apparent.

Godias J. Drolet (J. A. M. A., March 11, 1933, p. 733) finds that in New York City from 1901 to 1931 the recorded mortality from diabetes has risen from 503 to 1,921, or, from a crude rate of 14.2 per hundred thousand to 27.1 and from a standardized death

rate of 17.3 to 27.9.

Among females diabetes mortality has increased more rapidly. The population of New York City is almost 30 per cent Jewish and in this racial group, the proportion of diabetic deaths to all other causes exceeds markedly that of the non-Jewish white population of the city.

#### DIABETES INSIPIDUS

Diabetes insipidus is recognized by the excretion of large quantities of nonsugar-containing urine, not directly due to an excessive intake of fluids (polydipsia). Connected etiologically with this condition the following have been mentioned: cerebral irritation, diseases and injuries of the cerebrum, diseases of the pituitary body and, finally, a primary cause in the kidney.

The diagnosis of the cause of diabetes insipidus having been made, the treatment may be aimed to cure the condition, or to prevent the operation of the cause A simple polyuria from overdrinking can, of course, be easily prevented. Nervous causes may be modified if there is not actually some pathologic condition in the brain. If the blood pressure is high, lowering it by proper baths, physical exercise, change to a warm climate, diet, or by vasodilators will prevent the simpler type. Polyuria may, however, occur with low blood pressure, caused by some disturbance of the brain, as theoretically low blood pressure should not cause diabetes insipidus. Such instances may be helped by the vasoconstrictor drugs, and especially by ergot. It is possible that this effect of ergot is due to its action in preventing cerebral irritation, cerebral congestion, and possibly the slight cerebral exudate that may occur. There seems to be a definite relationship in diabetes insipidus to postpituitary gland disturbance in many cases and subcutaneous injection of posterior pituitary extract is of decided temporary benefit.

Bernhard Zondek and H. Krohn (Klin. Wchnschr., July 30, 1932, p. 1293) report that they have demonstrated the presence of a new pituitary hormone— Intermedin. Marion B. Sulzberger (I. A. M. A., June 17, 1933, p. 1928) used Intermedin in the treatment of 2 cases of diabetes insipidus and found that it reduced both intake and output of fluid and thus reduced both intake and output of fluid and thus alleviated the symptoms. The effects achieved were proportional to the amount of Intermedin administered,

Two cases of diabetes insipidus were studied to determine the relative effects of the usual treatment by subcutaneous injections of solution of pituitary and a modified treatment by intranasal insufflation of a powdered posterior lobe preparation (Frances M. Smith,  $J..A.M.A._M$  March 3, 1934, p. 660). Intransas insuffation of the powder in doses of from 40 to 50 mg, three times a day was shown to be as effective in maintaining a normal water balance with attendant alleviation of all symptoms as from 1.5 to 2.0 c. of double strength solution of pituitary administered sub-cutaneously. Advantages of the powder treatment include case of application, absence of intestinal, cardio-vascular or other side effects, and most of all a reduction in cost to less than one fifth that of solution of pituitary.

## PELLAGRA

The pellagra death rate computed in 1924 as 2.5 in each hundred thousand of population rose steadily to 5.7 in 1928 and in 1929 was 5.5 (Editorial, J. A. M. A.,

Feb. 21, 1931, p. 614).

Pellagra is probably not the result of an infection, although any infection present in the person is likely to make it worse, whether that infection is focal or parasitic, as from a hookworm. It does not seem to be due to an ordinary vitamin privation. The existence of a pellagra preventing vitamin designated successively as P-p, B, and G has been postulated. This is a part of the vitamin mixture formerly designated as water soluble B. It has become possible to separate products such as yeast rich in vitamin B complex into parts, of which one is conspicuously antineuritic and another protective against a form of dermatitis that arises in experimental animals in its absence. Milk, meat and yeast are relatively rich in vitamin G. in which the cereal grains are poor. On such considerations, prophylactic measures have been based (Editorial, J. A. M. A., Feb. 21, 1931, p. 614). Goldberger made a study of this disease, and concluded (Medicine, May 1926, p. 79) that there is little doubt that pellagra is caused by a faulty diet and is in the nature of a deficiency. He often declared that in uncomplicated cases of pellagra of average severity, administration of a diet rich in animal protein foods, milk and meat is generally followed by evident improvement in from ten to fourteen days. In severe cases the disease progresses, in spite of diet, to a fatal termination. Goldberger urged that all associated abnormal conditions from which the patient is suffering be treated and removed if possible. The disease seems more likely to develop in the spring months, from March to June, and gradually disappears during the summer, as a result of the change of diet offered by the summer season. Unsanitary conditions, of course, aggravate

the disease.

W. J. MacNeal some years ago described pellagra as a chronic disease with periods of activity and periods of more or less intermission. In the period of activity, he says, one may note "a prodromal stage, an erythematous stage, a stage of hyperkeratosis and desquamation, and a stage of sequelae and convalescence." Generally there is a long prodromal period, although a cutaneous erythema may develop suddenly. There is anorexia, indigestion, and some burning sensations of the hands and feet, with frequent depression and sometimes dizziness. there are tender spots and tender nerves, with more or less neuritic pains. There may be profuse diarrhea or constination; in women there is frequently disturbed or suppressed menstruation. There is soon loss of weight. A slight eruption appears on the backs of the hands and forearms, and red macules develop which may disappear and again return, and sometimes may persist. This seems to be a prelude to erythema. MacNeal says that the typical pellagrous eruption finally appears suddenly, "often over night, as a diffuse ervthema or as separate red macules, quickly becoming confluent on the knuckles and the backs of the fingers and hands and extending into the wrists and forearms." He says that at the same time, or subsequently, a similar eruption may appear on the upper surface of the feet, on the face and back of the neck, the sternal region, upper arms and legs, the perineum, and in the axillae, but rarely on other parts of the body.

MacNeal declares that the diagnostic location is on the backs of the hands, and that the typical crythema is a hyperemia, with tumefaction. The affected skin is very sensitive to any irritant, even sunlight or contact with the air. "Itching may be complained of, but there are never signs of scratching." In a few days desquamation occurs, and in from one to two weeks the skin thickens over the underlying erythema, although there is desquamation. This condition, MacNeal adds, may continue for weeks and months, although usually for about four weeks. In brunettes there is increased pigmentation. Finally "the eruption tends to disappear, the desquamation exposing a thin, parchment-like smooth epidermis, more translucent than normal with a pink, somewhat hyperemic dermis beneath." The eruption persists longest at its margin.

There is always some inflammation of the mouth which "may vary from a slight reddening to a condition in which the entire visible mucous membrane is covered with fibrinous exudate." Salivation may be slight or severe. "Chronic pellagrins often present an irregularly swollen and fissured tongue." Swallowing may be painful. There is often diarrhea, and the stools are of foul odor, containing mucus and sometimes blood.

While nervous and mental disturbances are rare in children, they are rather common in adults, the principal forms of which are peripheral neuritis and so-called pellagrous insanity. MacNeal finds that some mental disturbance occurs in about forty per cent of all cases of pellagra, most frequently in women. The types of insanity are mental depression; melancholia, or depression of the religious form; occasionally there are suicidal tendencies. There is rarely increased temperature in pellagra; in fact, it is generally subnormal, and the pulse rate is high while the blood pressure is low. The average duration of the acute attack is about four weeks. although a second attack may begin before the first is over. While there is some evidence of self-limitation of the condition, the duration is certainly shortened by proper food and nursing. MacNeal seems to think that cold weather or a cooler climate is beneficial. He says that after improvement it should be said that the disease has been "arrested"; it cannot be asserted that it has been cured, as recurrent attacks are frequent.

### TREATMENT OF PELLAGRA

All physicians who have had much experience in the treatment of pellagra agree that in the milder cases the symptoms will almost always disappear in a relatively short time if the patients are kept in a hospital, at rest, on a liberal mixed diet, with plenty of fresh meat In the hygiene of the disease, the avoidance of direct sunlight except in spring and summer is of the greatest importance. There seems to be no doubt that the skin

of the pellagrin is hypersensitive to sunlight.

Goldberger, Wheeler and Rogers (Pub. Health Rev., Feb. 19, 1926, p. 297) maintained that pellagra is prevented by a daily allowance of 200 Gm. (about 7 ounces) of fresh meat in the form of lean beef. This seems to prove that fresh beef contains a pellagra preventive factor. Steak, roast beef or mutton may be allowed once or twice daily; if the mouth is too sore to allow chewing, finely chopped meats may be substituted. Eggs are generally permissible. Sweet milk is valuable when it agrees with the patient. Fresh or artificially soured buttermilk is nearly always suitable. patient should be nourished to the limit of assimilation. Goldberger advises that beans and peas may be eaten, if fresh meat cannot be secured. In the winter the dried, not the canned, variety of the vegetables should form as large a part of the diet as in summer. Goldberger (Pub. Health Rep., Jan. 9, 1925, p. 54) has found that dried brewers' yeast is markedly curative in pellagra in the amount of from 15 to 30 Gm. (1 to 2 ounces) daily.

Goldberger presented the following dietary schedule: Breakfast: sweet milk, daily; boiled oatmeal with butter or with milk every other day; boiled hominy grits or mush with a meat gravy or with milk every other day; light bread or biscuit (one-fourth soy-bean meal), with butter, daily. Dinner: a meat dish (beefstew, hash, or pot roast, ham or shoulder of pork, boiled or roast fowl, broiled or fried fish, or creamed salmon or codfish cakes), at least every other day; macaroni with cheese, once a week; dried beans (boiled cowpeas with or without a little meat, baked or boiled, soy beans with or without a little meat), two or three times a week; potatoes (Irish or sweet), four or five times a week; rice, two or three times a week, on days with the meat stew or the beans; green vegetables (cabbage, collards, turnip greens, spinach, snap beans or okra), three or four times a week; corn bread (one-fifth soy-bean meal), daily; buttermilk, daily. Supper: light bread or biscuit (one-fourth soy-bean meal), daily; butter, daily;

milk (sweet or buttermilk), daily; stewed fruit (apples, peaches, prunes, apricots), three or four times a week, on days when there is no green vegetable for dinner; beanut butter, once or twice a week; syruo.

once or twice a week.

This diet is primarily for older children and adults. The intelligent housewife will make such modifications as the age of her children, tastes and particular circumstances make necessary. The quantities of some of the foods may be reduced and replaced, in part or in whole, by other similar foods, but so far as possible no reduction should be made in the quantities of milk and lean meats. For young children eggs make a very desirable addition and the relative quantity of milk allowed them may advantageously be increased.

#### MEDICAL TREATMENT OF PELLAGRA

Experiments with the feeding of pellagrins as outlined have resulted in marked improvement, and as a
result, much of the hypermedication formerly administered to patients with this disease has been discontinued. Cod liver oil may benefit these patients, diluted
hydrochloric acid may be needed, and perhaps some
endocrine gland treatment is indicated. Salicylates will
generally stop nerve and joint pains. If the patient is
thin and his appetite is poor, he should be put to bed
and kept at rest and fed, whether he wants food or not.
However, hydrochloric acid or yeast vitamins may
stimulate his appetite. It has been suggested that unless
a diarrhea in these cases is very severe and prostrating,
it is well not to check it rapidly.

Recent studies made by government departments indicate that a diet to which is added from two to four ounces of dry skim milk or one pound of evaporated milk or one to two ounces of wheat germ, or one and one half pints of canned tomatoes or one ounce of pure dry yeast per person per day to the food supply customarily used in winter will lower greatly the inci-

dence of pellagra.

Hydrotherapy has in many instances proved so beneficial in pellagra that some form of it, accompanied by special massage, may be employed in nearly every case. Increased oxidation of the tissues, more rapid elimiGOUT 447

nation, greater metabolic activity, sharpened appetite, improved digestion and assimilation, and a noticeable tonic effect on the whole organism follow these physical measures.

#### GOUT

The exact etiology of gout is as yet unknown. There are, however, numerous factors so constantly associated with this condition as almost to assume the nature of primary etiologic influences, The disease seems primarily to be a hereditary or acquired inability of the individual to metabolize purine bases properly. Gout occurs usually among the well-to-do, though the poor are not exempt, especially those who are heavy eaters or indulge in alcohol, and it is commonly associated with mental strain or fatigue. The disease is not common in this country, and it is easily confused with mild forms of arthritis deformans. Although it may occur at any age, it is most frequent in older persons, and occurs at a time when pyorrhea of the mouth is almost always present; but gout does not seem to be caused by any infection, although it may easily be combined with arthritis deformans, which is due to infection

## SAY M PTO MATOLOGY

The symptom ordinarily considered almost pathognomonic of gout is the occurrence of sudden pain in a metatarsal phalangeal joint, associated with all the signs of acute inflammation such as redness, swelling, fever and moderate leukocytosis. Accompanying the acute attack there is an excess of uric acid in the blood and urine, but the excretion of both endogenous and exogenous uric acid is diminished except during the acute seizure. In this country the typical big toe gout (acute gout) is rare, although gouty fingers are not so infrequent. As has been stated, a better understanding of arthritis deformans has prevented, in later years, the more frequent diagnosis of gout. Sometimes gout causes gastro-intestinal pain, which may be associated with some spasm of arterioles in the abdomen, perhaps not dissimilar to the phenomena of Raynaud's disease. Gout may be associated with thyroid and parathyroid disturbances, and perhaps with suprarenal disturbances. In the chronic form of the disease the joints affected become thickened and

COUT

deformed, tophi, chalky deposits, develop, and the patients suffer from shooting pains, increased arterial tension and gastric disturbances. The tophi consist of urates.

#### TREATMENT

On account of our inexact knowledge of the etiology of this disease, treatment is directed toward increasing the elimination of uric acid and lessening its formation.

The food of the gouty patient usually needs to be modified; especially must the purines be restricted, and the habits of the patient regulated to secure proper

eating and elimination of waste products.

During an acute attack the diet must be purine-free. It should consist of simple fresh fruits, cereals, bread, milk, cream, butter, beans, rice, potatoes, macaroni, string beans, greens, lettuce, cheese, cereal coffee, or coffee freed of caffeine, and plenty of water. Sugar

and salt should be used sparingly.

By determining the eliminative capacity of the body for exogenous uric acid, it is possible to keep the intake of purines well within the limit. The continuous use of alkaline drinking waters causes a deposit of sodium urate in the joints and cartilages, and such drinks should be forbidden. Very little salt should be used, as it tends to the formation of the sodium urates. Tea. coffee and cocoa are especially rich in purines and fresh vegetables, excepting beans and peas and the various cereals, excepting oatmeal, may be freely eaten.

Willard J. Stone (J. A. M. A., Sept. 6, 1930, p. 709) suggests that the following foods be restricted for patients with gout: meats, including liver, kidney, sweethreads and brains; fowl and fish, including anchovies, sardines, oysters, crabs and lobsters; meat broths; coffee; tea and chocolate. Most vegetables contain but little purine with the exception of mushrooms, shell beans, peas, lentils, asparagus, cauliflower and spinach. If it is desirable to place a patient on a purine-free diet, such vegetables should be restricted. Dairy and cream cheese contain moderate amounts of purine. The most suitable diet in gout consists of the following purine-free foods: milk and buttermilk; eggs; cream or vegetable soups; bacon, cereals, including tapioca; macaroni and spaghetti; white and corn bread, butter and sugar; jam and marmalades; potatoes, carrots, celery, onions, cabbage, lettuce, cucumbers, radishes, string beans, olives; Swiss, Edam, limburger and Roquefort cheese; ice cream; all fruits and nuts.

General Measures .- Patients differ and the methods which are extremely successful with one may fail utterly with another. The patient must be individualized. A correct diet, with no other measures. may produce improvement, but to prevent recurrence of attacks the patient's mode of living should be as hygienic as possible. If his habits are sedentary he should be encouraged to take outdoor exercise without undue exposure to the elements. In cold weather patients with gout should wear warm shoes. The shoes should never be tight. Quite probably the localization of gout in the big toes is due to the fact that it is that part of the foot that is most injured by tight shoes. The gloves of gouty patients must be warm and loose. Whatever may be the cause of gout, foci of infection must be sought and eliminated; the blood, the excretory power of the kidneys, the liver function, and digestion, especially as shown by examination of the feces, should be studied, and a general survey should be made of the function of the endocrine glands. All excesses should be abolished. Treatment at spring resorts is sometimes efficacious through the ability to enforce there a hygienic regimen when such efforts have failed at home.

Medicinal Treatment.—In an acute attack proper cause must be given to the affected joint. Those measures which have been recommended for acute rheunatic fever may be tried, especially wrapping the joint well in protective bandages and applying heat locally. Elimination from the bowels and kidneys should be reculated and elimination through the skin should be

encouraged by appropriate hydrotherapy.

The administration of tincture of colchicum, 30 minins (2 cc.), has been the classic treatment for the acute attack of gout. During succeeding days half this doos is given. Colchicum may produce marked irritation of the intestines with watery stools and pain. This should be taken as evidence of sufficient action and the drug stopped. In nonnephritic cases salicylates may be given to encourage the elimination of uric acid. More recently cinchophen (atophan) has been widely used.

It has a selective action on the excretion of uric acid. The drug should not be administered too frequently (three or four times a day), and plenty of water should be drunk while the drug is being taken, lest uric acid crystals cause renal or uretral pains. In the acute attack of gout it is sometimes beneficial in reducing pain. Cinchophen should probably be the drug of first choice in the medicinal treatment of this disease. Frequent examinations of the urine should be made in all obese patients especially to note an intermittent, if not persistent plycosuria.

#### OBESITY

Obesity is a condition in which there is an accumuion of extraordinary quantities of fat. Unless the fat causes definite functional disturbance, no treatment is necessary. The table of height and weight at varying ares in the front section of the book will indicate what

is average weight.

L, H. Newburgh and Margaret W. Johnston (J. Am. Dietet, A., March 1930, p. 275) have insisted that obesity is always caused by an overabundant inflow of energy. The excess is deposited as adipose tissue. They remind us of features that are all too often overlooked in the study of human size: that body weight is the resultant of two factors, gain or loss of tissue and gain or loss of water. Their studies indicate that the response of various types of obese people to food and water does not differ from that of normal persons. All of them oxidize body tissues in accord with the prediction from the caloric deficit. In reply to a query as to how long a person may maintain his weight in the face of a diet deficient in calories, these authors cite their own observation that the failure to lose weight is only a matter of days. Thus far the longest period observed by them is sixteen days; usually it is shorter.

The treatment of obesity must include primarily a regulation of the diet, to prevent the ingestion of excess food over what the body can utilize and to arrange the body work to produce a greater demand for energy-

giving constituents.

### DIET

Many diets have been offered as cures for obesity. Certain general principles must be observed. An average of several of the best known diets is as follows: Protein, 140 Gm., fat, 40 Gm., carbohydrates, 90 Gm., calories, 1,320. The diet tables for diabetes should be studied for the caloric value of foods. It can be taken as a matter of fact that most people cat too much. The appetite may be better controlled and hunger appeased by small quantities of food taken frequently. Decreasing of the appetite is commonly advised and may be accomplished in several ways, notably by long chewing

of the food and limitation of the variety.

Friedenwald and Ruhrah give the following general directions: Avoid sugars and starchy food and take little or no fatty food. Eat sparingly and take but little fluid-and that apart from meals. Obese persons may eat small quantities of chicken, beef, oyster, bouillon or clam soups; meat once daily consisting of beef, lean, raw, scraped, boiled or broiled; steak, broiled; mutton, roasted; chops, broiled; chicken, boiled or broiled. Eggs should be eaten only soft boiled or poached. Of fish the following may be taken: oysters, raw; dry, nonoily fish. Of bread, only a small quantity should be allowed and then only in the form of stale wheat bread, zwieback, toast, graham or gluten bread, The following fruits, all of which are acid, may be recommended: lemons, oranges, uncooked apples. grapes, peaches, berries and cherries. Water should be taken sparingly at meal times. Tea and coffee may be taken, but without sugar or milk. Mineral waters, ordinarily, may be allowed in quantity sufficient to assuage thirst.

The following articles of diet should not be taken: rich soups, fried foods, pork, veal, stews, hashes, potted meat, liver, duck, goose, sausage, crabs, lobsters, preserved fish, salmon, bluefish, herring, hominy, oatmeal, rice, puddings, sardines, potatoes, sweet potatoes, beets hot bread or cakes, nuts, candies, pies, pastry.

### HYDROTHERAPY

The value of cold baths in the treatment of obesity, as well as special forms of hydrotherapy, is generally well known. Besides increasing the activity of the skin and aiding the circulation, it seems likely that such baths also accelerate the loss of fat. While various kinds of sweat baths will reduce weight, if a natient is

allowed to drink freely of water and to eat carelessly. he will again acquire, within a few hours, all of the weight he has lost by perspiration.

#### FYFRCISE

In the presence of circulatory disorders, exercise must be prescribed with caution; in other cases it is a valuable aid in producing loss of weight.

Walking and horseback riding, swimming, golf, tennis and graded calisthenics are of value.

Massage (if given vigorously and accompanied by passive motion) sometimes produces good results,

especially in those of established sedentary habits. The Zander apparatus produces passive mechanical exercise. Besides such machines, others combining weight lifting, pushing, pulling and stretching movements may be employed in suitable cases.

### MEDICINAL TREATMENT

Obesity cures of a fraudulent nature are legion. In most instances they are either dangerous, worthless, or both. Thyroid extract has been and still is the basis of many so-called fat reducers. Lemon juice has had its day and numerous iodide preparations have been exploited. Bladderwrack, a form of seaweed, has likewise had a peculiar vogue.

There is an endogenous constitutional type of obesity traceable to thyroid dysfunction. Congenital or acquired weakness or degeneration of the thyroid may induce obesity directly or the thyroid may become a factor in the obesity only secondarily; disease of the ovary or testis (deficiency of the interstitial substance), and disease of the pituitary body (adipose-genital dystrophy) may be factors in certain types of obesity. There may also be a combination of both the exogenous and endogenous type, especially in the young.

Throughout the endogenous forms, abnormal thyroid functioning is common to all, and treatment of constitutional obesity must be based on thyroid treatment. It is unwise to give a patient large doses of thyroid and allow him to take a diet only partially restricted. Unless the case is one of distinct subthyroid activity, with possibly pituitary subactivity, a diet restricted in its caloric value is absolutely necessary for successful

treatment. Large doses of thyroid will disturb these patients and do them more harm than good, although most of them need thyroid medication. Thyroid substance increases the protein metabolism, oxygen consumption, and carbon dioxide elimination. The dose should be from 1 to 5 grains (0.065 to 0.324 Gm.) a day, and is well administered in one dose, after breakfast. A good preparation must be obtained, as thyroid varies greatly in activity, and if given in tablet form the tablet should be crushed before swallowing. Many times a small dose of thyroid is made efficient by the coincident administration of a small dose of iodine, as one drop of the tincture, or perhaps 0.20 Gm. (3 grains) of sodium iodide. If the heart becomes rapid and the patient becomes nervous and sleepless, it is evident that the dose of thyroid is too large

The use of thyroid extract in obesity should always be controlled by a previous basal metabolism test. If this is normal or subnormal, it is safe for a physician to use thyroid. There is no exact dosage available, and the best practice is to start with small doses, gradually increasing. The small doses would be approximately 0.03 Gm, or one-half grain, twice a day. The patient should be seen frequently by the physician, who must keep a sharp lookout for fast pulse, nervousness or other symptoms resulting from thyroid stimulation. It is practically useless for an obese individual to expect reduction by thyroid unless his diet is restricted, and when dietary restrictions are followed thyroid is not needed as frequently

## USE OF DINITROPHENOL

W. C. Cutting, H. G. Mehrtens and M. L. Tainter (J. A.M. A., July 15, 1933, p. 193) found that alphadinitrophenol produced sustained increases in metabolism and body temperature, enormous activity of all metabolic functions and fatal pyrexia with excessive doses. Doses within therapeutic range cause in man significant increases in metabolism without fever. They feel that this effect might be useful in the treatment of obesity, hypothyroidism and similar depressed metabolic states.

Tainter et al. (J. A. M. A., Nov. 4, 1933, p. 1472) used the drug in treating 113 consecutive cases of

obesity. The treatment was not successful in only 12 of these cases; in 3 because of inadequate loss in weight, probably due to insufficient dosage, and in the other 9 because of undesirable reactions to the drug. An average loss in weight, between 2 and 3 pounds (0.9 and 1.3 Kg.) weekly was produced by an average daily dose of 0.3 Gm. (5 grains) of the sodiumdinitrophenol in capsules taken with meals. The drug has been administered to individual patients continuously for as long as four months without demonstrable evidences of cumulative or toxic effects. Hypertension and albuminuria associated with obesity were improved by dinitrophenol in a limited number of patients responding with reductions in body weight. The most important side action was a skin rash. The next important side action was loss of taste for salt and sweet. Both actions cleared up quickly after the drug was stopped

A suitable regimen of dinitrophenol medication for addits would appear to be an initial daily dose of 100 mg, of the sodium salt orally taken with meals with an increase at weekly intervals until a dose is established which causes a loss in body weight of from 2 to 3 rounds weekly, or too marked or unpleasant

symptoms of warmth and sweating.

Cutting and Tainter (J. A. M. A., Dec. 30, 1933, p. 2099) studied the effects of the drug on basal metabolism, nitrogen balance, urinary organic acids and body weight in subjects on balanced diets and on diets unbalanced by the inclusion of maximal amounts of carbohydrates, fat or protein. With the use of these diets the basal metabolism was increased by from 30 to 50 per cent during medication with dinitrophenol. The subjects excreted less nitrogen than they ingested, yet there were definite losses of body weight. Therefore, body proteins probably were not broken down. The output of urinary organic acid was not increased, this indicating that the fats were completely burned without giving rise to acidosis.

Two cases of death from poisoning with dinitrophenol are reported in *The Journal of the American Medical Association*, April 7, 1934, pp. 1141 and 1147. In one case the dosage taken was far beyond what has been established as a safe dosage. In the other case, the amount while excessive was below that thought to be a fatal dosage. Human beings evidently have a more variable and unpredictable susceptibility to dinitrophenol than do animals. There is evidence to indicate that special susceptibility to the drug is far more frequent than drug sensitivty as applied to most other medical preparations.

When administering the drug, the patient should be informed thoroughly concerning such dangerous manifestations as increased temperature, severe urticain and pruritus, and immediate discontinuance of the preparation on the appearance of any symptoms of this character is recommended.

#### ROUTINE OF TREATMENT

The patient who wishes to be scientifically treated for obesity must be willing to place himself unreservedly in the hands of his physician for a long period of time, from six months to a year, and to obey all instructions implicitly. The treatment is begun by a study of the patient's habits of living and eating. The obese patient should be taught to take more exercise, which may be gradually increased, depending on his circulatory strength. It is unwise for him to take any exercise or any severe hydrotherapeutic measures that cause a serious lowering of the blood pressure or a rapid heart rate. Graded exercises will generally increase his circulatory strength. If the patient is sedentary, massage and mechanical muscle exercise is of advantage. The patient should be weighed once every week. A loss of more than 2 pounds (0.9 Kg.) a week is generally inadvisable. The total number of pounds that a patient should lose depends on his condition, his previous history and that of his family. If most members of his family are stout, and if he has always been overweight, it is inadvisable to be too strenuous in reducing his weight. If the obesity is a personal affair, very frequently endo-crine gland disturbance is the cause. Most all of these patients, however, have overeaten, and even from 10 to 15 pounds (4.5 to 6.8 Kg.) overweight is an unnecessary load on the heart. When the calories are reduced it should be remembered that too little sugar and starch may cause a low blood sugar content, with its resultant nervousness, and also diminished muscle activity and

increased muscle tire. Such a condition must be guarded against and too strenuous a diet should not be given.

Various systems of diets to reduce weight have been

offered. In the Banting system the proteins are increased, while the carbohydrates are greatly diminished and very little fat is allowed. In the Epstein routine, the normal amount of proteins is allowed and considerable fat, while the carbohydrates are greatly diminished. In the von Noorden treatment the proteins are increased and the carbohydrates and fats are much diminished, while in the Oertel therapy the proteins are increased, the fats much diminished, and the carbohydrates very greatly reduced. In the Hirschfeld treatment all kinds of food are greatly reduced. Perhaps this is one of the best methods. More rapid loss of weight may be caused by the Karell treatment, which is an absolute milk diet, the amount per day depending on the condition of the patient. In the Schweninger treatment, the intake of fluids is greatly limited. As has been shown repeatedly both by medical and nonmedical experiments in the reduction of weight of groups of the obese, systematic controlled treatment by appropriate measures is invariably successful.

## THE BANANA-SKIM MILK DIET

George Harrop (J. A. M. A., June 16, 1934, p. 2003) suggests a reducing diet based mainly on skimmed milk and bananas. When used continuously in this diet, one or two large ripe bananas may be eaten with one glass-ful (250 ec.) of whole milk for both breakfast and lunch. This is followed by a restricted evening meal, consisting of clear soup, a slice of lean meat (or fish or fowl) two or three portions of 5 per cent vegetables, a slice of bread and butter, and a portion of uncooked fruit. Such a diet will contain from 1,000 to 1,200 calories and may be continued for an indefinite period with satisfactory results.

The second method involves the use of bananas and skimmed milk alone for periods of from ten days to two weeks, then alternating with a more liberal regimen. The strict diet consists of six bananas and 1,000 cc. of skimmed milk to be eaten in three meals or more, spaced according to the habits of the individual. Buttermilk made from skimmed milk may be used in place of ordinary skimmed milk. Lettuce and cabbage with mineral oil dressing may be taken with one of the meals each day.

### REDUCTION OF LOCAL ORESITY

The reduction of local accumulations of fat is a difficult and uncertain matter. General weight reduction accompanied by vigorous exercise of the affected parts is sometimes successful. Dancing and rope skipping are the exercises of choice. A brisk rubdown, with massage of the affected parts after exercise periods, might also help. If the patient is not overweight, the reduction diet should be intermittent so as not to cause too much general weight loss. The exercises, however, should be maintained indefinitely, since there appears to be an increased tendency for the deposition of fat around well developed muscles, once the exercise of those muscles ceases.

# DISTURBANCES OF THE HEART

Hypertension, 458—Acute Pericarditis, 470—Myocardial Disturbances, 473—Endocarditis, 477— Chronic Valvular Disease, 481—Compensation, 489— Angina Pectoris, 495—Auricular Fibrillation, 500 —Heart Block, 505.

The disturbances of the heart have assumed the most prominent place in the list of causes of death. Tuberculosis, pneumonia, and kidney disorders are also leaders. Although the majority of sudden deaths are due to a cardiac cause, there are few chronic diseases so amenable to treatment and so compatible with long life and comfort, if judiciously handled, as cardiac cases. Of late years also there have come into prominence numerous delicate methods of examining the functions of the heart and of testing its rate and its rhythm. These newer methods have pointed the way toward efficacious therapeutic measures.

## THE PREVENTION OF CARDIAC DISTURBANCES

Recent studies of focal infections have shown that tonsillities, an absessed tooth, or other focus of infection may be the origin of germs that later may cause endocardities, or valvular infection. Patients are likely to manifest a desire to become active too soon after a serious illness or a surgical operation. The physician or surgeon should not submit the patient to such strenuous cardiac tests. If there is marked rapidity in the heart rate and a very low blood pressure on first sitting up in bed, the period of rest must be prolonged, and the return to activity should be slow and graded. Serious cardiac disturbances in young men who have indulged too vigorously in athletic competition are frequent.

### HYPERTENSION

THE BLOOD PRESSURE

Most physicians are now familiar with the methods of determining the systolic and diastolic blood pres-

sures and with the significance of variations from the normal in the readings. The average pulse pressure is about 35 to 40 mm. (difference between systolic and diastolic pressures). Faught believes that the relation of the pulse pressure to the diastolic pressure and the systolic pressure is 1, 2, 3. In other words, a normal young adult with a systolic pressure of 120 should have a diastolic pressure of 80, and therefore a pulse pressure of 40. If these relationships become markedly abnormal disease is developing and imperfect circulation is in evidence, with the danger of broken compensation occurring some time in the future. It should be remembered that the diastolic pressure represents the pressure which the left ventricle must overcome before the blood will begin to circulate, that is, before the aortic valve opens. The pulse pressure represents the power of the left ventricle in excess of the diastolic pressure. A high diastolic pressure is of serious import to the heart; a diastolic pressure over 100 is significant of trouble and over 110 is a menace. A systolic pressure higher than 150 is serious, and anything over 200 usually indicates renal insufficiency.

# ETIOLOGY OF HYPERTENSION

One of the most common conditions associated with hypertension is excess in eating and drinking. One of the first steps toward improving and lowering blood pressure in such cases is to diminish the amount of food. Alcohol, by affecting the appetite and increasing the amount of food taken, and by interfering with the activity of the digestive tract, can indirectly disturb metabolism and thus affect the blood pressure. It should always be eliminated when the blood pressure is high. Drugs or other substances that raise the blood pressure by stimulating the vasomotor center or the arterioles, when constantly repeated, may cause hypertension. This seems to be particularly true of caffeine and nicotine as taken in the form of coffee and tobacco. Thayer found a distinct relationship between hypertension and hard work. With such work is usually associated a hypersecretion of the suprarenals. Neurotic disturbances, and in some instances neurasthenic conditions, may lead to a blood pressure higher than normal.

Lead poisoning may be a cause of increased blood pressure, and diabetic persons occasionally have a hypertension, although more frequently the blood pressure is lowered in diabetes. Syphilis, as shown by Riesman, Levinson and others, is a very common source of hypertension and arterioselerosis without renal disease. When arterioselerosis and renal disease are combined, the highest systolic readings occur. It is now recognized that hypertension frequently occurs after the menopause, owing to an imbalance of the endocrine orlands.

According to Stieglitz, the most acceptable presentday conception of the etiology of hypertensive disease includes two groups of factors: (1) constitutional factors that predispose to hypertension and (2) initiating factors that provoke hypertension. The hereditary influences in the causation of this disease are unquestionably of the greatest importance. Familial hypertension is frequent. Constitutional factors may be operative in a number of ways; by contributing to an intrinsic instability of the whole vasomotor mechanism. by creating an unstable, intense emotional temperament, or by endowing an individual with an arteriolar mechanism poor in endurance (what has been aptly called "poor rubber") and vulnerable to the many factors that may persistently irritate the delicate equilibratory mechanisms of the circulation. It is often difficult to distinguish between purely hereditary or constitutional influences and familial factors that modify the constitution. Bad dietary habits, although obviously not hereditary, may be acquired in early childhood through familial influences.

In persons thus vulnerable, the initiating etiology of hypertensive arterial disease is "anything which persistently creates prolonged arteriolar stimulation." There is no single, common, uniform or invariable etiologic factor for all cases of the disease, nor will one ever be found. There are many who insist that he etiology of hypertension is still entirely unknown because of a failure to appreciate the inevitably large multiplicity of factors involved. The term initiating factors includes such sources of arteriolar stimulation as plumbism, endocrine imbalance and dysfunction, focal and other infections, erross and continued dietary indiscretions,

chronic arsenic or mercury poisonings, the intoxications of pregnancy, and other factors too numerous to mention. These sources of irritation cause the arteriolar response of hypertonia, with constriction of the vascular lumen and therefore hypertension. If the circulatory apparatus is thus stimulated for but a short time, the physiologic response disappears with cessation of the stimulation. If, however, the stimulation is prolonged, especially in persons made vulnerable through constitutional influences, the progressive changes of hypertensive disease are instituted, and from a state of arterial hypertension the disorder progresses to the arterial disease with hypertension. The mere fact that the causes are difficult of identification and are manifold and frequently superimposed does not justify the contention that hypertension is idiopathic or spontaneous. as implied by the term "essential hypertension."

The pathogenesis of the disease is at present fairly well defined. Continuous hypertonia of the arterioles causes hypertrophy of the medial musculature, as convincingly demonstrated by Keith, Wagner and Kernohan (Arch. Int. Med., February 1928, p. 141) and others. This hypertrophy creates a state of increased sensitivity to stimulation: the arterioles react in an exaggerated fashion to many minor stimuli. With long continued fatigue from continuous hypertonia, exhaustion inevitably follows. As certain smooth muscle cells become exhausted and necrosed, their place is taken by collagenic connective tissue. Thus there is a gradual but persistent evolution of the sclerosing process. It must be reemphasized that the sclerotic changes in the arterioles are the result rather than the primary cause of the hypertension.

From observation of individuals in two families, in whom hypertension occurred together with allergic disease, George L. Waldbott, (J. A. M. A., May 3, 1930, p. 1390) concluded that a certain number of cases of essential hypertension are due to allergic disease.

According to David Riesman (J. A. M. A., April 4, 1931, p. 1105), the majority of patients with essential hypertension are overweight. There is also a history of stress and strain throughout life. Race is an important factor, chiefly in that it determines the habits of the individual. To some extent, as in the Russian Jewish people, there is some innate tendency to cardiovascular disease, as shown in the frequency of thromboangiitis among them. Essential hypertension not infrequently sets in at the climacteric period in women. I. H. Musser and D. O. Wright (J. A. M. A. A. a. g.

J. H. Musser and D. O. Wight (7.4). 22.73, 701; 5, 1933, p. 422) studied a group of 30 patients who ranged in age from 34 to 67 years. The patients were selected because they were fat and had high blood pressure, in order to study their blood sugar response to a given amount of dextrose administered

by mouth.

It was found that all of these patients exhibited a lowered tolerance to sugar, but whether this had any relationship to the hypertension could not be stated. A second group of fat individuals without hypertension were shown not to have a hyperglycemia. It seems reasonable to assume, they conclude, that there is no one factor definitely responsible for the combination of obesity, hypertension and hyperglycemia unless it is obesity. The reduction in weight is often associated with a lowering of the blood pressure and a return of a sugar tolerance curve to normal.

## PREVENTION OF HYPERTENSION

The physician should continually caution the patients in whom the factors leading toward hypertension exist against the many things which will propagate and prolong that condition. They should be warned against severe athletic competition, recreation excesses, the immoderate use of tobacco, alcohol, and caffeine, and overeating. The pregnant woman should be examined frequently for changes in the urine and in the blood pressure. Patients with infectious diseases should have a slow convalescence during which they are carefully watched in order to prevent throwing too great a strain on weakened organs.

Stoll has outlined for the physician a most excellent series of "Don'ts" for patients with hypertensive cardiovascular disease, which are of distinct service in keeping the etiology and prevention of these conditions in

mind:

 Don't tell the patient with moderate hypertension and few symptoms, whose kidneys are functioning well, to stop eating meat or to go on a milk diet.

- Don't tell him to give up his business immediately;
   try to readjust his life so that unnecessary cardiovascular strain is reduced to a minimum.
- Don't tell him his kidneys are "all right," just because his urine exhibits neither albumin nor casts.
- 4. Don't miss the significance of nocturnal polyuria and a persistently low specific gravity.
- Don't give nitroglycerin tablets to your patient the moment you discover that he has hypertension. Perhaps he requires a high pressure to get the blood through his small inelastic vessels.
- 6. Don't be satisfied with the systolic pressure—the diastolic is of more significance. [Italics ours.]
- Don't attribute the insomnia, nervousness and headaches in the middle aged woman to "the change" —take her blood pressure and examine her eyegrounds.
- Don't make a diagnosis of neurasthenia till after a blood pressure estimation and a Wassermann test. It may save subsequent embarrassment and even be of advantage to the patient.
- Don't think you are doing your whole duty to your pregnant patient when you have examined her urine. She may have hypertension but no albumin today and eclampsia next week.
- Don't consider hypertension solely a condition of middle life; it is occasionally present in childhood.
- Don't forget the old man's enlarged prostate.
   It may be the cause of the nephritic syndrome.
- 12. Don't hesitate to give digitalis when symptoms of cardiac failure are evident. It will not raise the blood pressure.
- Don't wait until the patient is water logged and the heart dilated before suspecting a failing myocardium.
- 14. Don't deny your sleepless, gasping patient, whose course is nearly run, the relief that only morphine will give.
- 15. Don't make a prognosis solely on the blood pressure or the phenolsulphonphthalein test. Each tells but part of the story.

16. Don't overlook the fact that cardiovascular disease is to a certain degree a familial condition, sometimes present in several generations, nor neglect to explain the importance of a yearly blood pressure estimation of all members of the family.

17. Don't exclude syphilis, especially a parental infection, as the cause of the hypertension solely because the Wassermann reaction is negative. Study the family history; examine the brothers and sisters, and our patient's children for signs of hereditary syphilis.

18. Don't fancy that the management of hypertension consists in watching a column of mercury or that success is measured in millimeters.

#### TREATMENT OF HYPERTENSION

Active treatment in hypertension should begin with a thorough cleansing of the gastro-intestinal tract by purgation. Following this the most important measure in the management of high blood pressure is the proper regulation of the personal habits and diet. Constination should be kept under control by feeding fruits and vegetables, avoiding those that produce flatulence. The embargo on meat foods may be absolute at first and later meat may be added to the diet according to the response of the patient. Alcohol, tea and coffee should be forbidden. The patient should be encouraged to drink milk, if it agrees with him. If the patient can be sure of good excretion, large quantities of fluid may be taken, but it is very important that the elimination be watched; if an appreciable portion of the fluid remains it adds quantity to the fluid in the blood vessels and thus does harm. Allen (J. A. M. A., March 6, 1920, p. 652) has especially emphasized the value of salt and water restrictions in cases of so-called pure hypertension as well as in nephritis.

In the diet for hypertension of the essential type there are a few points in regard to which there is general agreement, according to David Riesman (J. A. M. A., April 4, 1931, p. 1105): Quantity is more important than quality. All meals, especially the evening one, should be light. With normal blood chemistry and normal urine it is unnecessary to exclude meat entirely. A small portion of meat once a day is pertage. missible. The obese should cut down fats and starches and make up the deficit in bulk with vegetables. Riesman advises his patients to reduce the salt intake to the minimum.

It is problematic whether the moderate ingestion of sodium chloride does any harm to patients with hypertensive arterial disease without appreciable renal impairment. Excesses of salt, as excesses of any constituent of the diet, are unwise (Trusler, H. M.: Disturbances in Sodium Chloride Metabolism, J. A. M. A., Aug. 25, 1928, p. 538). There is a division of opinion as to the advisability of a rigid "salt free" regimen in the management of hypertensive disease, but the majority of clinicians who have thoroughly considered the problem are inclined to conclude that the moderate use of salt (as ordinarily used in cooking, without additional salt at table) is noninjurious (Strouse, Solomon, and Kolman, S. R.: Tr. A. Am. Phys., 1923, p. 531. Stieglitz, E. J.: Arterial Hypertension, New York. Paul B. Hoeber, Inc., 1930). If any injury does occur, it is probably more attributable to the sodium ion than to the chloride ion. The use of potassium salts to replace sodium chloride has been suggested (Addison, W. L. T.: Canad. M. A. J., March 1928, p. 281). In the absence of renal functional impairment the moderate ingestion of table salt will not harm the hypertensive patient.

A patient with simple hypertension but otherwise well should have recreation periods one or more times a week and vacations not too infrequently. He should take a brisk purgative once every week or two. Sweat baths, electric light baths and similar methods may be utilized. Overheating and sweat baths must be administered with caution, as prostration and unpleasant symptoms are readily caused by such treatments. When properly supervised, these measures are often of value, but they are many times ordered by the physician, carried out by a nurse, and frequently repeated without proper medical control.

Probably the one measure of greatest importance in these cases is sufficient rest in bed. Freedom from either physical or mental strain is an essential factor in lowering the blood pressure. Hydrotherapeutic therapy, including the use of properly controlled heat and sweat baths, must be considered with relation to each

patient's condition.

After a period, which may be termed the normal era of hypertension in normal life, as age advances the systolic tension may become lower, provided there is no kidney lesion. This is due to the slowly developing chronic myocarditis and a lessening of the tension of life

When the blood pressure suddenly becomes excessively high from any cause, venesection may be life saving, and it should perhaps be more frequently utilized than it is. It may save a sudden heart attack or a cerebral henorrhage. Patients with high tension may be bled frequently and as much as half a pint taken at a time. Such treatment, however, will not save life indefinitely, as the blood pressure in most cases soon returns to its previous height.

## DRUGS IN HYPERTENSION

The drugs that are most commonly used to lower blood pressure are the nitrites or drugs of that class including glyceryl trinitrate, sodium nitrite, erythrol tetranitrate and anyl nitrite. Other drugs more rarely used are iodides, thyroid, alkali and bromides. Sodium iodide in small doses, 0.20 Gm. (3 grains), two or three

times a day is often of benefit.

Amyl nitrite is required only when a sudden immediate effect is desired in angina pectoris or in some other serious spasmodic condition. Sodium nitrite is more likely to upset the stomach than is glyceryl trinitrate. Its action is, however, of longer duration. The dosage is from 0.03 Gm. to 0.06 Gm. (1/2 to 1 grain), best given in tablet form, with plenty of water. The tablets may be crushed before swallowing. Glyceryl trinitrate, in doses of from 1/500 to 1/100 grain (0.12 to 0.6 mg.), three or four times a day, in the form of a soluble tablet is very useful. It acts in two or three minutes and the blood pressure may drop 20 or more millimeters. Thyroid extract seems to be of benefit in many cases and, if tachycardia is not present, it may be tried. Pancreas substance, whole gland, in tablet form, in a dose of 2 grains (0.13 Gm.), given three times a day, after meals, often helps to reduce blood pressure, provided the hypertension is "essential" and not due to kidney defect. The physiologic reason for such action is uncertain. As rest is essential in the treatment of hypertension, if the patient is sleepless,

hypnotics should be used at night.

Fifty-eight patients with hypertension were treated with sodium bromide and phenobarbital for a period of three months or more by M. H. Fineberg (J. A. M. A., June 7, 1930, p. 1822). Of these patients, 22, or 37 per cent, showed a sustained drop in the pressure of 30 mm. or more. All these patients and many who did not show a drop in pressure were subjectively improved. Potassium thiocyanate in doses of 11/2 grains (0.097 Gm.) three times a day failed to cause any drop in blood pressure. Of 22 patients who were given this drug in a dosage of 5 grains (0.3 Gm.) three times a day, 12 showed a drop in pressure of 30 mm, of mercury or more. The subjective improvement was greater when sedatives were used, while the lowering of pressure was more marked with the use of the potassium thiocyanate.

David Ayman (J. A. M. A., May 30, 1931, p. 1852) insists that there is no clear evidence to show the clinical value of the thiocyanates in hypertension (essential). Potassium thiocyanate has a hypotensive effect that is almost always associated with distress-

ing side reactions.

To a series of 40 unselected hypertensive patients, Ayman (I.~A.~M.~A.,~July~26,~1930,~p.~246) administered seriously and enthusiastically a daily dose of dilute hydrochloric acid; and the symptoms were definitely improved in 82 per cent. He therefore concludes that the symptoms associated with uncomplicated essential hypertension may frequently be relieved by the suggestion inherent in any seriously and enthusiastically prescribed drug. He believes this to be the basis of many successes reported.

Edward J. Stieglitz obtained good results in the treatment of arterial hypertension with bismuth subnitrate in 60 per cent of 200 patients with systolic and

83 per cent with diastolic hypertension.

The ill repute of the nitrite vasodilators for the treatment of hypertension has probably been exaggerated. It is a fundamental principle of sound therapeuties that the injured structures be given the maximum of rest. In hypertensive arterial disease the primary injury is the continuous hypertonia of the medial musculature of the arteriole. Arterial sedation, mild and long continued, is an important part of the management of hypertension. To be of any permanent or curative value, such sedation must be continued for months.

The chief basis for criticism of the nitrite vasodilators is the transient nature of their planmacologic effect. Of the soluble nitrites and nitrates (sodium nitrite, amyl nitrite, glyceryl trinitrate ["nitroglycerin"], erythrol tetranitrate, mannitol hexanitrate and spirits of ethyl nitrite) mannitol hexanitrate is said to have the most prolonged effect, the arterial tension usually remaining below previous levels for from five to six hours, whereas the effects of sodium nitrite ordinarily persists for from one to two hours. The extent of the fall increases with the dosage, but the duration of action is not much influenced by the amount administered. After the initial violent drop in pressure that occurs on the inhalation of amyl nitrite, the tension may rise to levels in excess of the original reading.

Nitrites are not wholly innocuous. Large doses cause the formation of methemoglobin. Increased tolerance to the alkyl nitrates (especially to nitroglycerol) is acquired quickly, so that the dosage must be increased to obtain the usual effect. Avoidance of the drug for a few days usually restores the responsiveness. It is claimed that tolerance is not acquired to sodium nitrite or to erythrol tetranitrate. Excessive acute reduction of the arterial tension may cause relative hypotension with impairment of the cerebral circulation, especially if the hypertension has been long standing and arterioselerosis has occurred. The dose of 0.13 Gm. of sodium nitrite, although within the accepted range, is a liberal one. It would appear more logical to give smaller doses more frequently, so that a milder effect might be maintained longer.

Because the fleeting nature of the vasodilator effects of these soluble compounds makes the induction of persistent and prolonged arterial sedation difficult, the use of a poorly soluble nitrate, which is reduced to nitrite by B. coli, has been suggested. Bismuth subnitrate, 0.6 Gm. (10 grains) three times daily for weeks, has proved in the hands of a number of investigators to be a safe and often valuable adjunct in the management of hypertensive disease. The slow but continuous liberation of nitrite by the bacteria of the bowel generally maintains a continued mild vasodepressant effect. In the amounts indicated, bismuth subnitrate is nontoxic and rarely induces constination. Its administration is safe. The thiocyanates, on the other hand, are more active arterial sedatives, but are too toxic to be safe. Although a few have doubted whether appreciable nitrite is obtained for the bismuth subnitrate reaction, it has recently been demonstrated that the nitrite content of the blood is distinctly increased by bismuth subnitrate as well as by sodium nitrite

Aside from continued arterial sedation, it is imperative that therapy include correction of any causative factors that may be amenable to therapy.

In essential hypertension, treatment with drugs, except at times organotherapy, promises very little in the control of this condition. Probably just as much can be accomplished through rest in bed, correct diet, free purgation, regulated exercise, and appropriate

hydrotherapeutic measures.

Joseph L. DeCourcy, et al. (J. A. M. A. April 7, 1934) state that they have felt for some time that the picture of essential hypertension is one of an endo-crine dyscrasia and that the responsible glands are the suprarenals. Assuming that essential hypertension is due to excessive secretion of epinephrine by hyperplastic suprarenals, comparable to the excessive secretion of thyroxine in hyperplastic thyroids, they have attempted to reduce the secretion by subtotal supra-renalectomy. The operation as performed by them consists of the removal of about two thirds of each suprarenal and is done in two stages. In 6 patients on whom they have operated, cortical tumors were found twice. In some of the cases, the operation relieved all symptoms of hypertension.

# PROGNOSIS

A follow up study of 222 of 401 hypertensive patients examined for from five to eleven and one-half years was made by John M. Blackford and his co-workers (J. A. M. A., Feb. 1, 1930, p. 328). He found a gross mortality of 50 per cent, a male mortality of 70 per cent and a female mortality of 30 per cent. The death rate was twice as high in extreme cases as in the mild and moderate. There was an average duration of life after the first observation of thirty-two months for males and forty-four months for females. Known causes of death were thirty-one from cerebral complications, twenty-five from heart disease, eighteen from uremia. Women with hypertension sometimes outlive their expectancy. Men almost never do.

## HYPOTENSION

Hypotension is more frequent than has been supposed. It occurs, of course, in chronic debility from any cause, or following a recent severe illness. Sometimes it occurs when there is focal infection, and such a cause is often removable. It may result from the overuse of tobacco. Sometimes it is found in families, several members of whom have a continued, persistent low blood pressure. Some adults are very active in spite of a systolic pressure of only from 100 to 110. Drug treatments are generally unsuccessful. Graded outdoor exercise is of benefit.

Especially important in low blood pressure is a study of the endocrine system and of the basal metabolic rate. Sometimes with a basal metabolic rate below—10 administration of thyroid extract in small quan-

tities brings distinct benefit.

# ACUTE PERICARDITIS

Pericarditis is almost invariably a secondary condition, the most frequent infectious cause being rheumatism, others being erechrospinal meningitis, acute miliary tuberculosis, pneumonia and sepsis. Accidental sources are traumatism, and an adjacent inflammation of the pleura. Pericarditis may also be a terminal condition in nephritis, adjacent abscesses, cancer and other new growths. The most important

sign for diagnosis is the so-called friction rub, usually best heard in the fourth and fifth interspaces near the sternum.

#### TREATMENT

Of primary importance in the treatment of pericarditis is absolute rest. The patient should not be allowed to sit up in bed, even to eat or to urinate or defecate. He should not have visitors. Anything that hastens the heart beat increases the irritation of the

inflamed surfaces of the pericardium.

Just what can be done locally or generally to combat the inflammation actively must depend on the cause. When the inflammation occurs as a complication of acute rheumatism, it has been suggested that salicylates that are not benefiting rheumatism should be stopped: but if the salicylates are apparently improving the inflammation in the joints, pericarditis would not contraindicate their continued use. Except in large doses, salicylates probably do not depress the heart. In pericarditis it is well to administer an alkali in some form, whether the cause is rheumatism or not. Diminished alkalinity of the blood is likely to increase pericardial or endocardial inflammation. Alkali may be freely given. It is possible that one of the reasons why pericarditis or endocarditis occurs so frequently in serious prolonged fevers is that the patient has not eaten enough cereals or other carbohydrates, and the system has become more or less acidotic. In other words, carbohydrate starvation is inexcusable with our present understanding of the danger from even a diminished amount of alkali in the blood.

The most valuable local treatment is cold, which may be applied either in the form of an icebag or by a small coil through which icewater is caused to flow by siphonage. Cold may be applied continuously, depending on the sensations of the patient. The bag or icecap must not be overfilled and must not be heavy, as the patient often cannot stand pressure over the pericardium. Sometimes the relief from pain and the diminution of the number of the heart beats from the application of cold is marked, and from this reason alone the cardiac inflammation may be inhibited. If cold applications are not tolerated by the patient (and they often are not in children) warm

applications may be used, such as cloths wrung out of hot water and covered with oil-silk, and the pain will often be thus relieved. While hot applications would not tend to abort the inflammation, they probably do not tend to promote it.

The intake of food and especially of fluids should be decreased, but the nutrition of the nationt should

not be allowed to suffer

A diminished diet, a small amount at a time, and such purging as the patient's strength will allow are essential in attempting to curtail the seriousness or amount of this inflammation. Too great a quantity of fluids tends to increase tension and delay absorption.

Pain.-Nowhere else in the body should pain be so speedily combated as when it occurs in the region of the heart. Morphine or codeine should be administered as needed to control the pain. The icebag may obviate the frequent need of morphine. If morphine is contraindicated other sedatives may be employed. Depressing measures should not be resorted to unless the state of the circulation is good.

Exudate.-It is not known how much is to be gained by indirect measures tending to prevent exudation and to hasten resorption of the exudates. However, purging, diuresis and the local application of blisters have been employed for these purposes. The saline purges should be used only if the heart is strong. If the circulation is weak, the vegetable purgatives or calomel may be employed.

For diuresis potassium citrate and, if deemed advisable, digitalis may be employed. However, if there is associated myocarditis, digitalis is contraindicated in

this acute condition

If, in spite of all the therapeutic measures suggested, the fluid increases and the pericardium becomes more distended and the heart's action more labored, paracentesis must be done. The point where the aspirating needle should be inserted into the pericardium depends somewhat on the conditions in the individual case. It is often best to insert an exploratory needle first. In cases in which the apex cannot be localized, the sixth interspace near the mammillary line is frequently the point utilized. Thayer suggests that the physician seek a point a little outside of the sup-

posed position of the apex, if it can be definitely determined that the heart is enlarged or dilated. Preliminary puncture will determine the fluidity and the character of the exudate. If pus is found, a more radical surgical procedure than simple paracentesis must be done immediately. The point of puncture for aspiration most frequently chosen is the fourth or fifth intercostal space, about an inch to the left of the sternal margin. Paracentesis is also often done in the region of the normal apex beat. The position of the patient is determined by the dyspnea; he should lie in the position most comfortable for him. The fluid should be withdrawn slowly and the pulse carefully watched. The withdrawal of a small amount of fluid may later seem to be the starting cause of resorption of the rest of the fluid. On the other hand, it often accomplishes nothing but the removal of the immediate pressure; the fluid may again accumulate, and more radical surgery must be performed. The amount of fluid withdrawn should not exceed 6 ounces (178 cc.) at any one time.

Convalescence.—The convalescence should be prolonged as in any other cardiac inflammation. The patient should be given more and more nourrishing food, and a capsule containing 0.05 Gm. of quinine and

0.05 Gm. of reduced iron, three times a day,

It is a question as to when patients convalescent from pericarditis should be permitted exercise. It has been thought that gentle movements and possibly exercise, sooner than theoretically justified, might cause the heart to beat a little more actively and possibly prevent the formation of tight adhesions between the two layers of the pericardium. Whether such activity of the heart will prevent adhesions has not been determined.

Small doses of sodium iodide, perhaps 0.2 Gm. (3 grains), twice a day, should be continued for some time. Iodides in this dosage do no harm and may do a great deal of good in these cases.

# MYOCARDIAL DISTURBANCES

The condition of the myocardium or heart muscle is often the determining factor as to whether a patient will live or die. If the myocardium has degenerated at the end of a long severe illness, a too rapid attempt at a return to ordinary activities may bring about a dilatation of the heart, which is itself responsible for sudden death or prolonged disability.

### HEART FUNCTION

As Sir James Mackenzie has repeatedly emphasized, most important in the examination of the heart is the study of how it responds to effort. For this purpose numerous functional tests have been proposed, varying from simple effort to those requiring elaborate apparatus. Rapidity of the pulse and respiration two minutes after hopping a hundred times on one foot was the test utilized in army examinations. A rise of blood pressure after exercise normally occurs within thirty seconds. If this is delayed to more than a minute, the heart's capacity has been exceeded. When the patient has cardiac disability, the regulation army tests must be greatly diminished. In fact, bending over to the floor from a standing position thirty, twenty, or even only ten times may be sufficient to demonstrate the patient's cardiac strength. Another test is to have the patient lie down, and after resting a few minutes suddenly rise to a standing position; or he may be studied after going up a flight of stairs. The blood pressure reading, the speed of the heart, and the length of time it takes both to return to normal will show the patient's ability to take exercise or to work. These functional tests are of the greatest importance in outlining the patient's future work and habits.

# Acute Myocarditis

Practically all acute infections cause more or less mycacrditis. It is exceedingly rare, indeed, that an endocarditis occurs without an accompanying myocarditis. The condition is not diagnosed until a sudden acute dilatation calls for emergency treatment.

The symptoms are often indefinite. If an acute myocarditis develops the apex beat is less positive and less accentuated and later diffuse and feeble. The closure of the aortic valve is less typically sharp, showing that the blood vessels are not so thoroughly filled. The peripheral circulation may not be active, the blood pressure falls, and the heart becomes more rapid, especially after exertion. John B. Deaver (J. A. M. A., Nov. 29, 1930, p. 1641) declares that myocardial disease is a prominent cause of death after operations on the biliary tract, and that in many cases the infection in the gall-bladder is no doubt responsible for the myocarditis.

The prevention of this condition is rest. Patients should not be allowed to attempt too rapid a convalescence after an infectious disease, a labor, or a surgical operation. Such cardiac tonics as digitalis are inadvisable; fluids should be diminished. Vaso-contractors such as ergot should not be given; large amounts of food should not be taken into the stomach at one time. Massage may be of service to promote return circulation to the heart. Cardiac debilitating drugs should not be administered when myocarditis has been diagnosed. The safest hypnotic is morphine in small doses. Calcium may be of value in this condition, and perhaps the best salt to administer is fresh calcium lactate in doses of 0.40 Gm. (or 6 grains) three or four times in twenty-four hours, or 0.50 Gm. (7.5 grains) once a day.

# Chronic Myocarditis

Chronic myocarditis is the term applied to a condition which is not an inflammation but a long continued degeneration. It is often a part of an arteriosclerosis. This being the case, the causes are all of the conditions that are associated with the appearance of arteriosclerosis: old age; syphilis; gout; repeated attacks of rheumatism; overuse of alcohol, and prolonged wasting diseases, such as tuberculosis or cancer. Focal infection, especially in the mouth and tonsils and adjacent sinuses, must be sought, and if present removed, as it can only aggravate all cardiac inflammations. The myocardial changes are sometimes associated with chronic pericarditis and thornic endocarditis, and may accompany or follow valvular disease of the heart.

The symnotoms of chronic myocardid degeneration

are progressive weakness, slight at first, noticeable on exertion; the pulse frequently becomes more rapid. The amount of urine may diminish and there is likely to be edema of the lower extremities toward night. The pulse may become intermittent and then irregular.

The physical signs often show an enlargement of the heart. Such a heart may act perfectly until a sudden exertion causes it to weaken, giving cardiac distress signals, the patient becoming prostrated for a variable period. Slight cardiac pains and sensations referred to the cardiac region become frequent.

## TREATMENT OF CHRONIC MVOCARDITIS

Patients with chronic myocarditis should avoid physical effort and mental wearniess; should take moderate or minimum amount of fluids; should reduce the quantities of food taken; should cause daily free movements of the bowels; should take warm (not hot) baths daily to clean the skin and promote prespiration; should take a correct amount of cautious exercise, or should undergo carefully directed calisthenics or massage. The patient should avoid chilling the body or placing any other sudden strain on the weakened heart musculature. Complete rest one day a week and one month in the year will aid in prolonging life.

A diet of fow protein content, from 60 to 70 Gm. daily, especially if nephritis is present, is better than the usual 120 Gm. diet. The intake of meat, strong soups and protein vegetables should be moderate, and all articles causing intestinal fermentation should be eliminated. The dietary should, of course, be otherwise

regulated to meet the individual case.

If there is a high blood pressure, it should be man-

aged as has been advised.

When an iodide is deemed advisable, the sodium salt is best, given either in a saturated solution or in a solution in water of which a dose would be a tea-

spoonful, well administered in milk,

There is no syrup or tasteful menstruum that will well disguise the taste of an iodide. It is much better to give these preparations in water and allow the patient to take them either in milk or effervescing water, or in any solution that he may prepare to suit his taste, or he may follow the drug with any taster that he desires.

Aquae...q. s. ad saturandum

M. Sig.: Five drops, in water, three times a day, after

[Each minim represents about .065 Gm. (1 grain) of the drug. A drop, however, of a saturated solution is less than a minim.]

If, in spite of this management and treatment, the patient has attacks of dyspnea, with or without pain, and especially if there are pendent edemas, the question arises as to whether or not digitalis should be given. In such cases one cannot tell without trying whether digitalis will be of benefit or will cause more discomfort. A small dose of an active preparation should be given at first twice in twenty-four hours, and after a week once in twenty-four hours, its action being carefully watched in order to arrive at the proper dosage. Digitalization is not advisable in this condition.

#### ENDOCARDITIS

Acute endocarditis rarely, if ever, occurs without some myocarditis, and not infrequently pericarditis also accompanies these conditions. Endocarditis is divided for discussion into acute mild (simple) endocarditis; acute bacterial (ulcerative) endocarditis; chronic endocarditis, and valvular disease, the endresult of endocarditis inflammation.

# Acute Mild Endocarditis

It has been shown positively that acute endocarditis is due to micro-organisms, generally streptococci, staphylococci, or pneumococci, and (more frequently than once believed) gonococci. The most prominent causes are acute rheumatic fever, diphtheria, preumonia, cerebrospinal meningitis, scarlet fever, erysipelas, influenza, chorea, gonorrhea, sepsis and typhod. It may also follow a follicular tonsilitis which is rheumatic in type but has not caused arthritis. Tuberculosis may occasionally cause an endocarditis, and an acute condition may suddenly develop from a released focal infection, causing bacterial endocarditis.

This inflammation of the endocardium is generally confined to the region of the valves, and the valves most frequently so inflamed are the mitral and the aortic. There may be a slight inflammation or actual ulceration and loss of tissue. Vegetations occur on the inflamed suffaces, with danger of particles becoming loosened and moving free in the blood stream, causing embolic obstruction of aterioles in distant parts of the body. There is also probability of serious adhesions or contractions occurring from the healing of the

ulcerated surfaces. In other words, the future health and welfare of the valves depends on whether or not the inflammation heals without contractions or adhesions.

It is often difficult to decide when acute endocarditis has developed, but with the knowledge that the endocardium often becomes inflamed during almost any of the acute infections, the physician should repeatedly examine the heart for murmurs, for muffled closure of the valves, or for other evidences of endocarditis or myocarditis during the acute infective process.

#### SYMPTOMS

Among the early symptoms of endocarditis, which is often not recognized until the appearance of a valvular lesion, may be pain or discomiort in the heart region and a rise in temperature. Frequently, also, there may be some dyspnea. Patients so affected are usually nervous and restless, and inclined to show anxiety on even moderate exertion.

### TREATMENT

In the treatment of mild acute endocarditis rest, both mental and physical, is of primary importance. This should be continued for from four to six weeks and should be absolute. To counteract muscular flabbiness, massage should be given, from simple rubbing and

kneading to passive movements.

The medicinal treatment includes the use of alkalis. These may be given as sodium citrate in doses of 2 Gm, every six hours, in wintergreen water. If the salicylates are being prescribed to counteract rheumatic infection, sodium bicarbonate may be given in equal dosage. To counteract the anemia likely to develop, iron may be administered as 5 drops of the tincture of the chloride in lemonade or orangeade, twice in twenty-four hours. A 3 grain (O2 Gm) tablet of saccharated oxide of iron may be given twice in twenty-four hours. Pain may be combated by the use of morphine in adults or codeine, if the patient is a child.

For serious nervousness and restlessness, the bromides may be of value, and in case of insomnia, souluble barbital may be used, a dosage of from 3 to 5 grains (0.2 to 0.32 Gm.) being ordinarily sufficient.

The diet should at first consist largely of milk and cereals with a moderate amount of fluid and alkaline drinks. During convalescence a full diet may be prescribed, especially milk, eggs and fresh vegetables. The bowels should be kept open, but brisk catharsis is inadvisable. It is better to regulate the bowels by simple measures, such as the feeding of fruits.

The correct use of cardiac drugs is a difficult problem. If there is myocardiac or much endocardiac inflammation digitalis is inadvisable. If there are signs of failure of the cardiac muscle, camphor or strophanthin have been advised when prompt stimulation is needed.

For hyperpyrexia and profuse perspiration, the surface of the body should be sponged with lukewarm or warm water. Too profuse sweating may be combated with atropine.

## Bacterial (Ulcerative) Endocarditis

Ulcerative endocarditis may develop from the mild type or independently of it. It is essentially a soptic process and develops from a local focus of infection elsewhere in the body. The process may include disintegration of the heart muscle and deep points of erosion as well as little pockets of pus or abscesses in the muscle tissue.

The diagnosis is not so difficult if this condition develops on a mild endocarditis as when it appears primarily. The temperature is generally intermittent, accompanied by chills. There may be prostration and profuse sweats.

Meningeal symptoms—headaches, restlessness, delirium, stupor—are not uncommon and convulsions may occur. Enlargement of the spleen and congestion of the liver may be found. Albumin appears in the urine. Definite cardiac symptoms and cardiac weakessots may appear over the body. If emboli break off and are carried to different parts of the body they bring about symptoms of embolism in those parts. If mycotic, they may set up a local focus of infection; if lodging in a terminal artery, gangrene of the part concerned takes place, necessitating amputation, or perhaps causing death. Howard B. Sprague (J. A. M. A., April 5, 1930, p. 1037) believes that patients with rheumatic heart disease in whom mitral regurgitation persists without the development of evidence of mitral stenosis of marked degree are more likely to acquire subacute bacterial endocarditis than are those in whom the valve becomes obviously stenotic within a few years.

In cases of questionable malignant endocarditis, the presence of this disease should be more seriously suspected if mitral regurgitation is noted as a prominent clinical finding than if well marked mitral stenosis is

present.

#### TREATMENT OF BACTERIAL ENDOCARDITIS

The care of bacterial endocarditis includes treatment of the condition that caused it plus treatment of "mild" endocarditis, as previously described, with the meeting of all other indications as they occur. As in septic processes, the nutrition must be pushed to the full extent to which it can be tolerated by the patient, namely, small amounts of various nutritious.

foods given at three-hour intervals.

Whether milk or any other substance containing lime makes fibrin deposits on the ulcerative surfaces more likely to occur or more profuse, and therefore emboli more likely to occur, is perhaps an undeterminable question. In instances in which hemorrhages so frequently occur, as they do in this form of endocarditis. calcium is theoretically of benefit. Quinine has not been shown to be of value, nor has salicylic acid, unless rheumatism is the cause. If the patient is unable to take nourishment in sufficient amount, small doses of alcohol will be of benefit. It is doubtful whether ammonium carbonate tends to prevent fibrin deposits or clots in the heart, as so long supposed. In fact, whenever the nutrition is low and the patient is likely to have cerebral irritation from acidosis, whenever the kidneys are affected, or whenever a disease may tend to cause irritation of the brain and convulsions, it is doubtful whether ammonium carbonate or aromatic spirit of ammonia is ever indicated. Ammonium compounds have been shown to be a cause of cerebral irritation.

Bacterial endocarditis may prove fatal in a few days, or may continue in a slow subacute process for weeks

or even months.

## Chronic Endocarditis

It is not easy to determine when subacute endocarditis becomes chronic. The process manifests itself by a gradual sclerosis of the valves. It should be treated on the same principles as the acute type, depending largely on the supposed cause of the disease.

# CHRONIC VALVULAR DISEASE

As has been indicated, chronic valvular disease arises commonly as the result of acute or chronic endocarditis, the former from infections, the latter perhaps associated with syphilis, alcoholism, gout or focal infections.

The valvular disease may narrow or constrict the opening, giving rise to stemois, or it may render the valves incapable of closing correctly—called insufficiency. Because of its increased work, the heart muscle may hypertrophy. As long as this hypertrophy is adequate the heart continues its work satisfactorily and the valvular lesion is said to be compensated. When the muscle is degenerated it may be unable to accomplish its work and is said to fail, and symptoms of cardiac failure appear. As the heart chambers overfill and are emptied with difficulty, dilatation takes blace.

#### Mitral Stenosis

Perhaps 60 per cent of the cases of mitral stenosis, which occurs most commonly between the ages of 10 and 30, have their origin in theumatic endocarditis. This lesion is a serious handicap in such diseases as pneumonia, pleurisy or bronchitis, in which there is congestion of the lungs.

Among the more important symptoms are a murmur, diastolic and perhaps presystolic, heard over the left ventricle and accentuated at the apex. Usually there is an accentuated pulmonary closure. The pulse is generally slow; dyspnea on exertion is common and an increase of mucus in the throat is not infrequent.

As weakening of the compensation occurs, the heart beat becomes irregular; there is venous congestion of the head and face, cyanosis of the lips and sometimes hemoptysis. These patients suffer more or less from cold extremities.

Besides the usual treatment for broken compensation in patients with this lesion, digitalis is of the greatest value, and the slowing of the heart by it. allowing the left ventricle to be more completely filled with the blood coming through the narrowed mitral opening during the diastole, is the object desired. This drug acts similarly on the right and the left ventricle, and though there is no real occasion for stimulation of the left ventricle, as it is the right ventricle that is in trouble, dilated and failing, still a greater force of contraction of the left ventricle helps the peripheral circulation. The action on the right ventricle contributes greatly to the relief of the patient by sending the blood through the lungs and into the left auricle more forcibly. The left ventricle then receives an increased amount of blood, the congestion in the lungs is relieved and the dyspnea improves. Perhaps there is no class of cardiac diseases in which more frequent striking relief can be obtained with digitalis than in these cases of mitral stenosis.

If the congestion of the lungs is very great and death seems imminent from cardiac paralysis, and if cyanosis is serious and bloody and frothy mucus is being expectorated, venesection and an intramuscular injection of aseptic ergot may be indicated. Digitalis should also be given, hypodermically perhaps, but its action would be too late if it was not aided by other more quickly acting drugs, such as strophanthin, intravenously. The physician may often save life by such radical measures. When the venous pressure is high and the arterial pressure not too low, venesection will

aid in the restoration of compensation.

# Mitral Insufficiency: Mitral Regurgitation

This is the most frequent form of valvular disease of the heart, and is due to a shortening or thickening of the valves, or to some adhesion which does not permit the valves to close properly, the blood consequently regurgitating from the left ventricle into the left auricle during the contraction of the ventricle. Such regurgitation may occur without valvular disease, if for any reason the left ventricle becomes dilated sufficiently to cause the valve to become insufficient. Such a dilatation

can generally be cured by rest and treatment. As with mitral stenois, he most frequent causes are rheumatism and chorea, which are mostly due to mouth infection, with the occasional other causes as previously enumerated.

The characteristic murmur of this lesion is a systolic blow, accentuated at the apex, transmitted to the left of the thorax, generally heard in the back, near the lower end of the scapula, and transmitted upward

over the precordia.

Of all cardiac lesions, this is the least dangerous. Sudden death is unusual, the compensation of the heart seems to be most readily maintained, and the patient is not so greatly endangered by overexertion or by inflammations in the lungs. As in mitral stenosis, any increase in blood pressure—whether the normal increase after the age of 40, any continued earlier high tension, or increase from occupation or exercise—is serious. They cause the left ventricle to act more strenuously, so that more blood is forced back into the left auricle. The lungs become congested, and the right ventricle, sooner or later, becomes incompetent.

When compensation fails with these patients, the first sign is pendent edema of the feet, ankles and legs; subsequently, if there is progressive failure of

compensation, the usual symptoms occur.

The treatment is principally rest and digitalis, and the recovery of compensation is often almost phenomenal. Patients with this lesion are likely to be children and young adults, and the heart muscle readily responds as a rule to the treatment inaugurated. Later, in these patients, or if the lesion occurs in older patients, the return to compensation does not occur so readily. If the condition is developed from a myocarditis or from fatty degeneration of the heart, it may be impossible to cause the left ventricle to improve so much as to overcome this relative dilatation or relative insufficiency of the valve. If the dilatation of the left ventricle is due to some poisoning. such as nicotine, the heart muscle will generally recover with proper treatment-stopping the use of tobacco, administration of digitalis, and rest-and the valve will again properly close.

## Aortic Stenosis: Aortic Obstruction

Valvular disease at the aortic orifice is much less common than at the mitral orifice. While stenosis or obstruction is less common from rheumatism or acute inflammatory endocarditis than is insufficiency of this valve, a narrowing or at least the clinical sign of narrowing, denoted by a systolic blow at the base of the heart over the aortic opening, is of frequent occurrence in arteriosclerosis and old age. If such narrowing occurs without aortic insufficiency at the age at which it usually occurs, it may not seriously affect the heart. It may follow acute endocarditis, but it most frequently follows chronic endocarditis or atheroma, in which the aortic valves become thickened and more or less rigid; this condition most frequently occurs in men.

Anything that tends to increase arterial tension, as tobacco, lead, hard work, or severe athletic work, or anything that tends to cause arterial disease, as alcohol

or syphilis, is often the cause of this lesion,

At times the edges of the valves may grow together from ulcerative inflammation, and the lumen thus be diminished in size; or projecting vegetations may interfere with the opening of the valve and with the flow of blood. With such narrowing the left ventricle hypertrophies more or less rapidly to overcome its increased work.

The murmur caused by this lesion is a systolic one, either accentuated in the second intercostal space at the right of the sternum, or perhaps heard loudest just to the left of the sternum in this region. The murmur is also transmitted up the arteries into the neck, and may at times be heard in the subclavian arteries. It may also be transmitted downward over the heart. The pulse is slow, the apex of the rise of the sphygmographic arterial tracing is more or less sustained and rounded, and the rise is much less than normal.

If this lesion occurs in old age, there is general arterial disease present and the tension and compressbility of the arteries vary, depending on how much they are hardened. The disturbed circulation is evidenced by imperfect peripheral circulation and capillary sluggishness, with at times pendent edema of the feet and ankles, but, perhaps, little congestion of the lungs. The left ventricle being sufficient, there is no damming back through the left auricle to the lungs. The left ventricle may, however, become weakened, either by some sudden strain or by a chronic myocarditis, and relative insufficiency of the mitral valve may occur. The subsequent symptoms are typically those of loss of compensations.

This lesion may allow a patient to live for years, provided no other serious disturbance of the heart occurs, such as myocarditis or coronary disease; but sooner or later, with the failing force of the blood flow and the lessened aortic pressure, slight attacks of anemia of the brain occur, causing syncope or fainting. Also, sooner or later these patients have slight cardiac pains. They begin to "sense" their hearts. There may not be actual anginas, but a little feeling of discomfort, with perhaps pains shooting up into the neck, or a feeling of pressure under the sternum. Slight excitement or overexertion is likely to make the heart attempt to contract more rapidly than it is able to drive the blood through the narrow orifice. and this alone may cause cardiac discomfort and the feeling of cardiac oppression.

It is essential, then, that these patients should not hasten and should not become excited; any drug or stimulant that would cause cardiac excitement is harmful for them. Glyceryl trinitrate is of benefit in these cases, and with high blood tension may be the only safe drug for the patient to have on hand. As soon as the attack occurs, with or without real angina pectoris, the patient should dissolve a glyceryl trinitrate tablet in his mouth. If he feels faint, he will feel better the moment he lies down, and in this instance he may be improved by a cup of coffee, or a dose of caffeine, camphor or alcohol.

If the left ventricle becomes more feebbe and shows signs of serious weakness, or if there is actual dilatation, the question of whether or not digitalis should be used is a subject for careful decision. The left ventricle should not be forced to act too stremously against this arorite resistance. Consequently the dose of digitalis must be small. It frequently happens, especially in old age, that movoarditis or fatty degeneration has already occurred before this cardiac weakness develops in the presence of aortic narrowing, and digitalis may not be indicated at all. One cannot tell how far degeneration may have gone. Small doses of digitalis used tentatively and carefully, perhaps 5 drops of an active tincture, two or three times a day, and then gradually increased to a little larger dose to see whether improvement takes place, is the only way to ascertain whether or not digitalis can be used with advantage. If it increases the cardiac pain and distress, it should not be continued. Strychnine is then the drug that should be relied on, with such other general medication as is needed, combined with the coincident administration of glyceryl trinitrate. may be given in conjunction with digitalis, if deemed advisable. Generally, however, if a heart with aortic stenosis needs stimulation the blood pressure is none too high, although arteriosclerosis may be present. Therefore when glyceryl trinitrate seems advisable to lower blood pressure, digitalis is not usually indicated and when digitalis is needed to aid the heart, glyceryl trinitrate is generally not indicated. These patients must have good blood pressure to sustain perfect circulation at the base of the brain.

Persons who have this lesion should not use tobacco in large amounts, or sometimes even in small amounts, as tobacco raises the blood pressure and thus puts more work on the left ventricle; if the left ventricle is failing, much tobacco may hasten its debility. However, with a failing left ventricle and a long previous use of tobacco one need not prohibit its use absolutely. A failing heart and the sudden stoppage of tobacco may prove a serious combination.

Aortic Insufficiency: Aortic Regurgitation

The aortic lesion, though not so common as the mitral lesion, is found frequently in children and young adults as a sequence of acute rheumatic endocardits. If it occurs later in life it generally is associated with aortic narrowing, and is a part of the general endarteritis and perhaps atheroms of the aortic. Sometimes it is caused by strenuous exertion apparently rupturing the valve.

This form of valvular disease frequently ends in sudden death. Nevertheless it is astonishing how active a person may be with this really terrible cardiac defect. This lesion from the frequent overdistention of the left ventricle, is one that often causes pain. While the left ventricle enlarges enormously to overcome the extra distention due to the blood entering the ventricle from both directions, the muscle sooner or later becomes degenerated, from poor coronary circulation. Unless the left ventricle can do its work well enough to maintain an adequate pressure of blood in the aorta, the coronary circulation is insufficient, and chronic myocarditis is the result. If the left ventricle has maintained this pressure for a long time, edemas are not common unless the cardiac weakness is serious; that is, slight difficulty, in this lesion. does not give edemas as does some loss of compensation in mitral disease, and unless the weakness of the ventricle is grave the lungs are not much affected.

The physical sign of this lesion is the diastolic murmur, which is loudest at the base of the heart, is accentuated over the aortic orifice, and is transmitted up into the neck and the subclavian vessels and down over the heart and the sternum, with marked pulsations of the arteries (Corrigan pulse) and often of some of the peripheral veins, notably of the arms and throat.

If the left ventricle becomes dilated the mirral valve may become insufficient, when the usual lung symptoms occur, with hypertrophy of the right ventricle, and if it fails, the usual venous symptoms of loss of compensation follow. This lesion not infrequently causes epistaxis, hemoptysis and hematemesis.

Digitalis is always of value in these cases, but it should not be pushed. If a heart is slowed too much the regurgitation into the left ventricle is increased. Therefore such hearts should not be slowed to less than 80 heats a minute, or sudden anemia of the brain and sudden death may occur. These patients must not do hard work.

## Tricuspid Insufficiency

Tricuspid insufficiency rarely, if ever, occurs alone; it is generally a sequence of other valvular defects, and represents an overworked, dilated right ventricle. It may, however, occur from lesions of the lungs which impede the blood flow through them. Such are fibroid changes in the lungs, emphysema, prolonged chronic bronchitis, the last stages of pulmonary tuberculosis, old neglected pleurisies with cirrhosis or fibrosis of the lungs, and repeated attacks of asthma-anything, whether valvular defect or pulmonary circulatory disturbance, that increases the pressure ahead and the work of this ventricle

The symptoms are those of loss of compensation as described under other valvular lesions. There may be jugular pulsation, especially evident in the external jugular on the left side. The liver enlarges and may pulsate. There are edema, dropsy, ascites and perhaps hemorrhages. The heart is enlarged and there is a soft systolic blow heard at the lower end of the sternum. The dyspnea is sometimes very great, and cyanosis may be present, especially during paroxysms of coughing.

This lesion of the heart is always benefited by digitalis, but continuance of the improvement and its amount depend, of course, on the cause of dilatation of the ventricle. Strychnine is often of advantage. These patients should rarely receive vasodilators, and hot baths, overheating, overloading the stomach and vigorous purging should never be allowed. Sometimes improvement will not take place until ascitic or pleuritic fluid, if present, has been removed.

# Tricuspid Stenosis: Tricuspid Obstruction

Tricuspid stenosis is rare and probably always congenital; it is supposed to be due to an inflammation of the endocardium during intra-uterine life. In early childhood it is possible that it may be associated with endocarditis on the left side.

A special treatment of the heart would not be indicated unless there is associated tricuspid insufficiency.

when digitalis might be used.

# Pulmonary Insufficiency: Pulmonary Regurgitation

If the rare condition of pulmonary insufficiency occurs, it is probably congenital. A distinctive murmur of this insufficiency would be diastolic and accentuated in the second intercostal space on the left of the sternum. It should be remembered that aortic murmurs are often more plainly heard at the left of the sternum. Sooner or later, if this lesion is actually present, the right ventricle dilates and cyanosis and dyspnea occur. Digitalis would then be indicated.

Pulmonary Stenosis: Pulmonary Obstruction

If stenosis is actually present in this location, the lesion is probably congenital. It might occur after a serious acute infectious endocarditis, but then it would be associated with other lesions of the heart. It has been found concurrently with such congenital lesions of the heart as an open foramen ovale or foramen Botalli, or with an imperfect ventricular septum, and perhaps with tricuspid stenosis—in short, a congenital cardiac defect. The right ventricle becomes hypertrophied, if the child lives to overcome the obstruction.

The physical sign is a systolic blow at the second intercostal space on the left; but, as just stated, such a murmur must surely be dissociated from an aortic murmur if found to develop after habyhood. It should also be differentiated from the frequently occurring hemic, basic systolic murmurs. If signs of pulmonary lesions are not heard soon after birth or in early babyhood, the diagnosis of pulmonary defects can be made only by exclusion. An enlarged thymus gland may cause this type and location of murmur.

Unless the right ventricle is later found to be in trouble, there is no treatment for this condition. If the right ventricle dilates, digitalis may be of benefit.

# COMPENSATION

# The Compensated Heart

As long as compensation is complete no medication or physical treatment is necessary. However, a patient with compensation should so order his life as to throw the least possible strain on the taxed open converged athletic efforts, rushing up and down starts, produced tension and extreme worry are to be interdicted. Tobacco should not be used and alcohol, tea and coffee should not be taken. Ordinary diseases occurring in such patients should be treated with exceptional watchildness of the circulation.

# Broken Compensation

Rest in bed, in a pleasant room, with fresh air and sunlight, is of great importance. In patients over 50

years of age it may be a question whether some exercise should not be advised. The patient should be individualized and proper measures taken to give mental and physical rest, to prevent excitement, and at the same time to prevent mental depression.

# DIET

The diet should be adequate; not profuse and not deficient. Excessive quantities of fluids cause discomfort. The diet should be sufficiently varied to encourage appetite. In case there is dropsy the intake of fluids may be greatly restricted, and only a moderate quantity of salt should be included in the diet.

# FLIMINATION

The eliminative organs should be encouraged but not drastically. Hot sponge baths and warm alcohol rubs may be given, accompanied by gentle massage. Diuretics generally act unsatisfactorily in cardiac conditions. If the secretion of urine suddenly diminishes, the diet should be quickly reduced and perspiration (not to excess) should be encouraged. The bowels should move satisfactorily daily. Active watery purgings are rarely advisable and simple vegetable laxatives are usually sufficient.

# TREATMENT WITH CARDIAC DRUGS

Digitalis is the drug of chief reliance in this condition, depending, of course, on the amount of good heart muscle available for it to act on. It is advisable to use a tincture of known character beginning with a moderate dose, perhaps 10 drops every eight hours, and increasing a few days later to 15 drops once in twelve hours and later to 20 drops once a day. The digitalis leaf is now much used. The action in large doses is cumulative and with such doses the drug should not be continued longer than five or six days without intermission. A number of special prepara-tions of digitalis are described in New and Nonofficial Remedies. Digitalis or its preparations should not be used when there is a fatty degeneration of the heart; ordinarily it is inadvisable if there is arteriosclerosis or coronary disease. The signs of overaction of digitalis are nausea, vomiting, a diminished amount of urine. occipital headache, and coldness of the hands and feet.
The pulse may be reduced to 60 or less a minute. This is digitalization.

In such instances the drug should be stopped immediately, saline laxatives and hot sponge baths and perhaps alcohol or glyceryl trinitrate may be given.

Strophanthus is a drug of little value in restoring compensation, but strophanthin intravenously or subcutaneously acts quickly, stimulating the heart and

contracting the blood vessels.

Strophanthus given by the mouth in the form of the official interure can not replace the treatment of cardiac decompensation or failure with digitalis. In many conditions in which broken compensation is not present but the heart is irregular in action, with some cardiac distress and breathlesenses on exertion, the tincture of strophanthus in doses of 5 drops, in water, three times a day, after meals, is of marked benefit. It not only strengthens the heart somewhat but diminishes its nervous irritability and causes it to become more regular in its action. If the blood pressure is high, strophanthus is not indicated. Sometimes it causes indigestion and diarrhea. In such a case, the amount used should be reduced.

Caffeine, given as coffee or citrated caffeine, 1½ grains (0.09 Gm.) two or three times early in the day, acts as a stimulotonic to the heart, increasing its activity. It is contraindicated in the presence of good compensation. It is a cerebral stimulant. Strychnine promotes all muscular activity and is a general nervous stimulant. It may be indicated when the heart is acting sluegishly.

siuggishly

Faul D. White (J. A. M. A., June 24, 1933, p. 1993) says that weakness and failure of the left ventricle are common whether or not there is an associated right ventricular failure. It is important to recognize this fact and to be able to diagnose the condition, since treatment by the administration of digitalis, by rest or by both these measures is usually of great help, though the heart rhythm is normal and there is no evidence of congestion of the systemic vents.

The left ventricle is the primary site of strain four to five times more often than is the right ventricle: Essential hypertension, myocardial infarction from coronary

thrombosis, and aortic valve disease exceed in total frequency mitral stenosis, pulmonary valve stenosis and pulmonary disease sufficient in degree to be a strain. The most frequent cause of strain on, and enlargement and failure of, the right ventricle is left ventricular failure.

# CONVALESCENCE

When compensation has been restored, the patient may be allowed gradually to resume his usual habits and work, provided that these habits are sensible, and that the work does not require severe muscular exertion. Careful rules and regulations must be laid down for him, depending on his age and the condition of his arteries, kidneys and heart muscle. It should be remembered that a patient over 40 years of age. who has had broken compensation, is always in more danger of a recurrence of this dilation of the heart than one who is younger. After 40 the blood pressure normally rises, and this increase may be just too much for a compensating heart which is overcoming all of the handicap that it can withstand. Such patients, then, should be more carefully restricted in their habits of life, and also should have longer and more frequent periods of rest.

The avoidance of all sudden exertion in any instance in which compensation has just been restored is exceedingly important. The child must be prevented from hard playing, even running with other children, to say nothing of bicycle riding, tennis playing, baseball, football or rowing. The older boy and girl may need to be restricted in athletic pleasures, and dancing should often be prohibited. Young adults may generally, little by little, assume most of their ordinary habits of life; but carrying heavy weights up-stairs, going up more than one flight of stairs rapidly, hastening or running on the street for any purpose, and exertion, especially after eating a large meal, must all be prohibited. Graded physical exercise or athletic work, however, is essential for the patient's future health: At first walking and later more energetic exercise may be advisable.

These patients must not become chilled, as they are likely to catch cold, and coughs or lung congestions are always more serious in valvular disease. Their feet and hands, which are often cold, should be

properly clothed to keep them warm. Chilling of the extremities drives the blood to the interior of the body, increases congestion there, and by peripheral contraction raises the general blood pressure. With a weak heart generally the blood pressure needs to be strengthened, but a compensating heart rarely calls for efforts to increase the peripheral blood pressure, and any great increase from any reason is a disadvantage to such a heart. The patient should sleep in a well ventilated room, but should not suffer such exposure as is advocated for pulmonary tuberculosis, as severe chilling of the body must absolutely be avoided.

The peripheral circulation is improved, the skin is kept healthy, the general circulation is equalized, and the heart is relieved by a proper frequency of warm baths. Cold baths are generally inadvisable, whether plunge, shower or sponge; very hot baths are also inadvisable, because they cause faintness; warm baths are not stimulating and are sedative. The Turkish and Russian baths should be prohibited; they are never recommended in cardiac disease. Surf-bathing and, generally, sea-bathing and lake-bathing are not desirable. The artificial sea-salt baths and carbon dioxide baths may do some good, but they do not lower the general blood pressure so surely as has been claimed. and probably no great advantage is derived from them. If a patient cannot exercise properly, massage should be given intermittently.

Any systemic need should be supplied. If the patient is anemic, he should receive iron. If he has no appetite, it should be encouraged by a bitter preparation. If sleep does not come naturally, it must be induced by such means as do not injure the heart.

# Acute Heart Attack

The patient with valvular disease may suddenly be seized with an acute attack of agony in the region of the heart, dyspnea, and a feeling of oppression. A person in this condition may die at any moment.

The immediate conditions to be met are the rapid fluttering heart, nervous excitation and vasomotor spasm, as well as the cardiac anxiety. Two factors of great importance are the establishment of selfcontrol and confidence in the patient and the spontaneous relaxation following exhaustion. The part played by the nervous system in such attacks is shown by the good effects which may follow a hypodermic injection of morphine sulphate. It quiets the nervous system, encourages drowsiness, relaxes spasm, and thus causes increased peripheral circulation. While morphine is indicated, a large dose should not be given lest the activity of the respiratory center be greatly impaired. The addition of atropine to the morphine may prevent the depression and sometimes of itself quiets cardiac pain. It may, however, irritate the heart and will increase vasomotor tension. The patient should be put to bed and should recline on several pillows. For quick momentary stimulation smelling salts may be used. A tablespoonful of whisky or gin in twice the amount of water is advisable. Strychnine sulphate, 0.002 Gm., or 1/30 grain, may be given hypodermically as a stimulant to the central nervous system and to the cardiac nerves. Hot coffee may be given by the mouth. An injection of the contents of an ampule of camphor in oil may be administered intramuscularly and epinephrine may be given similarly. It is understood that these are merely suggested as alternative methods of treatment. The response of the patient should be carefully noted.

If the patient collapses, with serious dyspnea, subnormal blood pressure, cyanosis and feeble pulse, and does not have the tension of fear, the therapy should be somewhat different. Aseptic ergot may be injected at once intramuscularly. If the patient has not been overpowered (digitalized) with digitalis, it may be advisable to administer some form of this drug to

obtain the future continued action.

Strophanthin may be given intravenously, and in this way is a quickly acting stimulant. The dosage should be from \$\frac{1}{200}\$ to \$\frac{1}{200}\$ grain (0.12 to 0.3 mg.). It is inadvisable if the patient has received much digitalis.

If the emergency is excessively urgent, the lungs filled up with blood, moist râles beginning to occur, and frothy and blood-tinged sputum being coughed up, venesection may be done. If there is extreme air hunger the administration of oxygen aids to satisfy this need.

Large amounts of alcohol are contraindicated in these cases.

# ANGINA PECTORIS

Angina pectoris is a term applied to the condition manifested by pain in the region of the heart.

In the majority of such cases the trouble lies in the aorta, owing to some sclerosis of its coats. This disturbance is brought on by any exertion which causes more blood to be sent into the aorta than usual, and, with the diminished elasticity of this artery, pain ensues. Without doubt a source of angina pectoris is coronary sclerosis, but as just stated, causes just outside of the heart are probably more frequent than conditions in the heart itself. Fatty degeneration of the heart muscle will result in weak action of the heart but rarely real pain. In chronic myocarditis there is frequently cardiac distress, but not often real pain. On the other hand, a real angina can occur without pain, and may even be fatal without that symptom. The pain in this condition is frequently in the right side of the chest and radiates to the neck, or down toward the abdomen, or the liver, However, the typical pain of the true angina pectoris generally starts in the region of the heart, radiates up the left chest, into the shoulder, and often down the left arm. Such a patient is likely to assume a characteristic posture. He stops still wherever he is, stands perfectly erect or bends his body backward, raises his chin. supports himself with one hand and places the other over the heart. The duration of the attack is usually but a few seconds, but the patient may die in the first or in any subsequent attack. The pulse may become very slow. Profuse sweating, anxiety and dyspnea may accompany an attack. The pain may be felt especially in the upper part of the sternum over the aorta. Serious heart attacks may occur without nain.

Albert S. Hyman (J. A. M. A., April 12, 1930, p. 1125) found that in 412 patients with acute influenzal infection, 9 developed angina pectoris, although they had never had symptoms of the disease before. All the patients were in the middle age period. Electrocardiographic studies showed the presence of severe myocardial injury in most of these cases. Three of the patients died, 2 with extensive myocardial injury, but the third had apparently a good cardiovascular system. There was no relation between the severity of the original influenzal attack and the time of the onset of the first anginal seizure, nor was there any relation between the time of the seizure and the immediate outcome. Postinfluenzal angina pectoris must be considered as a not uncommon sequela in the convalescence from influenzal infections occurring in the middle-aged.

Howard F. Root and Ashton Graybiel (J. A. M. A. March 21, 1931, p. 925) reviewed 210 cases of angina pectoris complicating diabetes mellitus. The incidence of this disease in cases of diabetes mellitus is extraordinarily high. The nearly equal sex ratio suggests the leveling influence of the associated diabetes. The occurrence of angina pectoris in the young, the long duration of diabetes before the onset of this disease. and the late age of onset of angina pectoris all point to the complicating diabetes as the factor that makes this group differ from the nondiabetic patients. The prognosis for life is shorter than in the nondiabetic patients but should improve with modern dietary and insulin treatment. Diabetes mellitus with its associated coronary disease is a frequent contributing factor to the production of angina pectoris and like syphilis, its presence should be investigated by blood sugar analyses.

Paul D. White and Trimble Sharber (J. A. M. A., March 3, 1934, p. 655) analyzed the past habits in the use of tobacco and alcohol of 750 consecutive private patients with angina pectoris and of 750 persons without angina pectoris of exactly the same sex and age

grouping and from the same walks of life.

Comparison of the habits of the two groups showed that 46.1 per cent of the patients with angina pectoris had been abstainers from tobacco while 24.4 per cent had used tobacco to excess, in contrast to 37.2 per cent of the control series who did not smoke and 33.5 per cent who smoked excessively.

Total abstinence from alcohol was the history of 64.4 per cent of the cases of angina pectoris and of

61.1 per cent of the control series.

It appears from this study that neither the use of nor the abstinence from tobacco or alcohol plays an important part in the genesis of angina pectors. In occasional instances the use of tobacco apparently aggravates or precipitates attacks of angina pectoris and in some cases alcohol helps to prevent or relieve such attacks.

## IMMEDIATE TREATMENT

For treatment of the immediate pain, anything may be given that quickly relieves local or general arterial spasm and spasm of the muscles. The moment that the heart and its arterioles relax, the attack is usually over. The most quickly acting drug for this purpose is amyl nitrite, inhaled. If amyl nitrite is not at hand, or has been found to cause considerable discomfort of the head or a feeling of prolonged faintness, glyceryl trinitrate is the next most rapidly acting drug. It may be given hypodermically, or a tablet may be dissolved under the tongue. The amyl nitrite should be in the emergency kit of every physician, in the form of ampules, or it may be carried by the patient after he has had one attack. The ampules now come made convenient to carry so that the drug is ready for immediate inhalation. One of these is generally all that it is necessary to use at any one time. Glycervl trinitrate may be given hypodermically in a dose of 1/100 grain (0.6 mg.). If placed on the tongue the same dose should be repeated in ten minutes, if the pain has not stonned

Ålmost coincidentally with the administration of glyceryl trimitrate or the amyl nitrite a hypodermic injection of ½ or ½ grain (8 or 10 mg.) of morphine sulphate should be given without atropine, as full relaxation is desired without any stimulation of

atropine.

If the patient is at home and at rest at the time of an attack, a hot-water bag only slightly filled, or a pad electrically heated may be placed over the heart, sometimes with marked advantage. Occasionally even such

gentle applications are not tolerated.

After the attack is over absolute rest for some hours, at least is imperative. If the seizure was severe, the patient should rest several days, as there seems to be a tendency for such attacks to come in series, the cause being acutely present for at least some time. Little food should be given—nothing very hot or very cold, and a small amount of liquids; gentle cathariss may be induced on the following day, if deemed advisable; stimulating drugs should not be administered, and anything that will raise the blood pressure is contraindicated.

The question often arises whether the patient shall be told of the consequences of his condition. It is hardly wise to withhold this knowledge from him, and generally it is not necessary. The alert patient ordinarily senses the gravity of the situation, and will even reprove or joke with his physician for minimizing the danger. It is best that the whole subject he discussed carefully with the patient and that his life be regulated and ordered; in accordance emergency drugs should be prepared and given him, and the family properly instructed, so that he may prevent other possible attacks, and, if they occur, he may have the best immediate treatment. Not infrequently one or more seizures of real angina pectoris may occur in a certain period of time, and later the patient be immune from such attacks, live for years, and die of some other disease or cause.

#### PREVENTION

To prevent this disturbance of the heart the aim should be to seek the cause. The patient should be examined for syphilis, for disease of the kidneys, for focal infection, and for any other disease or condition that could have a bearing on the source of the angina. Cardiac insufficiency should, of course, be treated as usual.

It is of first importance that the patient live a regular life, and avoid oversextion, mental excitement, chilling of the body and anything else that seems to bring on the pains. Moderation in the diet, especially in the obese, should be the rule. Rest and diversion with graduated exercises are the greatest factors in the beneficial results of baths of the type given at Nauheim and other institutions. Essentially the same baths may be given at home by adding 9 pounds of sea-salt and 10 ounces of commercial calcium chloride to 40 gallons of water, with or without carbonic acid gas of water, with or without carbonic acid gas

The acute symptoms being over, a careful analysis of the probable cause of the anginal attack should be made. If there is a general sclerosis, the treatment should be directed to that condition. If there is a myocarditis or a fatty heart, this should be treated as myocarditis or a fatty heart, this should be treated as myocarditis or a fatty heart, this should be treated as previously described. If there is a toxemia from intestinal disturbance, that may readily be remedied. If the cause is nicotine, it need not again occur from

CORONARY THROMBOSTS BLDG.

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that reason, and perhaps the injury caused by the nicotine may be removed. Any organic kidney trouble must, of course, be managed according to its seriousness; and, if there is hypertension, treatment should be directed toward its relief. Inquiry should be made especially as to the possibility of syphilis being a factor. If thrombosis of a coronary arteriole is suspected, prolonged hed rest is indicated

Greene Fitzhugh and Burton E. Hamilton (J. A. M. A., Feb. 18, 1933, p. 475) have listed the significant events that preceded fatal attacks of angina pectoris or coronary occlusion in 100 cases. Sixty-eight patients had more than one such significant event, as an unusual and violent physical exertion, prolonged activity with fatigue, persistence in activity that had repeatedly caused angina pectoris, travel, emotional strain, alcoholic excess, gorging, starving, acute infection, surgical operation, medication, or unusual sexual activity. More often than not fatal angina pectoris or coronary occlusion are immediately preceded by unusual departures from ordinary habits of living, and these departures are generally preventable.

# PROGNOSIS IN CORONARY THROMBOSIS

The average length of life after the first known coronary thrombosis in persons of all ages is about three years, but this figure must be much modified according to the severity of the attack and the age of

the patient.

The less severe the initial attack and the less evidence after it of heart damage, the longer the life; and this is true at any age. A good example, though perhaps an unusual one, is that of a man, aged 63 at the time of his coronary thrombosis, who showed no evidence of heart disease two years later, climbed mountains rapidly with ease and without symptoms at the age of 72 and 73 years, and died finally at the age of 80 of apoplexy without heart failure, showing at postmortem examination a well healed myocardial scar involving also the pericardium in the posterior wall of the base of the left ventricle. This case was reported in The Journal of the American Medical Association, (Jan. 28, 1933, p. 233).

AURICULAR FIBRILLATION 500 FAITE

The younger the patient the longer the life after the first coronary thrombosis, other things being equal. However, even a fairly young person with a mild case, who might be expected to live for from ten to twenty vears, must be considered as presenting a poor risk for life insurance since sudden death or a second attack of coronary thrombosis within a few years, although not probable, is highly possible.

Advice to be given to help prevent further heart trouble in such a case can only be that of general good hygiene, chiefly the avoidance of excessive physical and nervous strain, of overeating and of infections. Healthy exercise regularly, long hours of sleep, maintenance of normal nutrition, avoiding obesity and big meals, and establishment of periods of leisure and of regular vacations are important. Since the fundamental cause-metabolic or otherwise-of coronary atherosclerosis and thrombosis is not yet known, more specific advice cannot be given.

## AURICULAR FIBRILLATION

·While auricular fibrillation is a clinical entity, it is often difficult of diagnosis, and sometimes can be excluded only by treatment and the results of treatment, or by watching the patient for some time. When completely present normal systolic contractions of the auricles do not occur, although there are little rapid twitchings of different muscle fibers of the auricles. which give the name to the condition.

The irregular pulse in auricular fibrillation is ordinarily distinctive, being generally rapid, from 110 to 180 or 190. When the pulse rate is 200 or more, the condition is termed auricular flutter. Occasionally the pulse rate may be much slower, if the heart is under the influence of digitalis. The irregularity of the pulse in these cases is excessive; the rate, strength and apparent intermittency during a half minute may not at all represent the condition in the next half minute, or in the next several minutes. It has been thought that auricular fibrillation, while prevented many times by digitalis or quinidine, is perhaps incurable. This is probably not true in the early stages of the condition. If digitalis or quinidine does not cure the irregularity, the condition has been termed the "absolutely irregular heart." Other terms applied to the condition have been "ventricular rhythm," and "nodal rhythm." The condition of the pulse has been Latinized as pulsus

irregularis perpetuus.

While the condition is best diagnosed by tracings taken simultaneously of the heart, jugular and radial arteries still the jugular tracing is almost conclusive in the absence of the auricular systolic wave. The radial tracing is exceedingly suggestive, and if it is taken with a careful stethoscopic examination of the heart, an almost certain presumptive diagnosis may be made.

#### OCCURRENCE

This condition of auricular fibrillation occurs occasionally in valvular disease, and perhaps most frequently in mitral stenosis; but it can occur without valvular lesions, and with any valvular lesion. If it occurs in younger patients, valvular disease is likely to be a cause; if in older patients, sclerosis or myocardial degeneration is generally present.

It may also follow depressing infections, such as diphtheria, or some infection that has caused a myocarditis. Rarely this fibrillation may be caused by

some of the drugs used to act on the heart,

It is astonishing how few symptoms may be present in auricular fibrillation and with an absolutely irregular heart action. The patient may be able to perform all of his duties, however strenuous, until coincident, concomitant or causative ventricular weakening and dilatation or broken compensation occurs. and then the symptoms are those due to the cardiac failure. Often in the first stage of this weakening and later fibrillation of the auricles the patient may recognize the cardiac irregularity and disturbances. Generally, however, he soon becomes accustomed to the sensations, and, unless he has cardiac pains or dyspnea, he becomes oblivious to the irregularity. At other times he may be conscious of irregular, strong throbs or pulsations of the heart, as such hearts often give an occasional extra sturdy ventricular contraction. These pulsations he notes. Real seizures of tachycardia may be superimposed on the condition. Sooner or later. however, if the fibrillation is not stopped, cardiac weakness and loss of compensation, with all the usual symptoms, occur. It seems to be probable that more than half of all cases of heart failure are due to auricular fibrillation, or at least are aggravated by it.

#### TREATMENT

The condition may be stopped by relieving the heart and circulation of all possible toxins and irritants, and by the administration of digitalis or quinidine. One attack is frequently followed by others, perhaps of longer duration. Occasionally, however, the patient may be observed for many years without the condition again occurring. If the pulse, in spite of treatment, is permanently irregular, and auricular insufficiency is permanent, the patient is of course in danger of cardiac failure; but still he may live for years and die of some other cause than heart failure. The prognosis seems to be better when the pulse is not rapid—below a hundred. This shows that the ventricles are not much excited and do not tend to wear themselves out.

Any treatment that lowers the heart rate is of advantage, such as the stopping of tea and coffee, the administration of digitalis, and an increased amount of rest

and quiet.

## USES OF DIGITALIS AND QUINIDINE

As suggested by White (J. A. M. A., Sept. 2, 1922, p. 782), the use of digitalis is indicated in only two conditions: first, in heart failure of the congestive type, and second, in auricular fibrillation or auricular flutter with a rapid ventricular rate, whether or not failure is present. If auricular fibrillation or flutter or congestive failure comes on in any of the acute infectious diseases, large doses of digitalis given by mouth or intravenously quickly combat the condition. White emphasizes the fact that digitalis acts not only as a stimulant in increasing the degree of systolic contraction in auricular fibrillation as well as in normal rhythm, but also, by its sedative action on the heart, it improves the circulation far more effectively in auricular fibrillation than in normal rhythm.

The digitalis may be given as the powdered leaf by tincture, infusion or in pill form, provided a potent preparation is used. In severe cases, enough should be given to saturate the system within forty-eight hours. It is then important to maintain saturation as long as the effect is required. As the adult human excretes from 0.1 to 0.2 Gm. (from 1½ to 3 grains) of the leaf daily, the equivalent of 1 to 2 cc. or 15 to 30 minims of the tincture, it is necessary to administer this amount every day to maintain saturation when

once it has been properly secured.

Overpowering of the system with digitalis has been termed digitalization, and consists in pushing the drug to the limit of intoxication and primary poisoning. A primary symptom of beginning digitalization is frequently headache, or at least a fulness or tight feeling in the head. When this symptom is well in evidence, the digitalis is generally stopped by the therapeutist. Unfortunately, this symptom is not always present, and complete digitalization will cause nausea, vomiting. complete loss of appetite for days, disturbance of vision, and generally a diminished secretion of the urine, although in the early stages of the large doses of digitalis the excretion of urine is increased. With digitalization the pulse should be slowed, but sometimes, unfortunately, the pulse becomes irregular both in volume and in rate and heart block may occur. The vomiting, while partially due to the slight irritant action of the drug in the stomach, seems largely due to a reflex from the nerve centers, and perhaps to its intrinsic action on the heart.

Laboratory and clinical investigations have shown that the amount of digitalization for an adult weighing 130 pounds (68 Kg.) is a minimum of 22½ grains (1.45 Gm.) and a maximum of 33 grains (2.20 Gm.). Half the minimum dose may be given at once and then 2 or 3 grains (0.13 or 0.2 Gm.) every six hours, or the other half of the minimum dose may be given on the second day. If the individual needs more digitalis for digitalization, the amount is gradually increased by 2 or 3 grains (0.13 or 0.2 Gm.), perhaps every six hours, until symptoms of digitalization appear. These manifestations depend on the inability of the system to excrete digitalis as fast as it is being ingested. The symptoms of digitalization will

last for several days until the major part of the drug has been excreted. Some digitalis, however, will remain in the system from one to two weeks, during which time any extra doses of the drug will prolong the symptoms of digitalization. It seems to be a fact that digitalization should not be attempted if the individual has previously been taking digitalis even in fair-sized doses, as the symptoms caused may be more severe than is desired. The dosage advised, estimated on weight, must of course be greatly modified with frail, underweight persons. An overweight person, when that weight is largely due to fat, must not be given the dosage according to his weight. When the dosage is advised the condition of the patient and his ability to excrete digitalis must be taken into serious consideration. Any condition that will diminish the activity of the kidneys and liver must of necessity cause more rapid storing of digitalis and also a slowed excretion of the digitalization dose, and therefore will many times cause very serious symptoms.

Harry Gold and Arthur C. DeGraff (J. A. M. A., Oct. 25, 1930, p. 1237) believe that in the average ambulatory cardiac patient with auricular fibrillation and moderate heart failure, a much lower effective concentration of digitalis in the body suffices to produce full therapeutic effects than is required in the average bed-ridden patient in advanced concestive failure.

Wenckehach found that quinine could on rare occasions abolish the absolute arrhythmia of the heart. He introduced the use of quinidine extensively. This, according to White, is indicated particularly in the treatment of auricular fibrillation of recent origin, preferably of less than six months' duration, when heart failure has not been, or is not, an important feature, and in the prevention of paroxysmal fibrillation. Chronic heart disease, especially chronic mitral stenosis and auricular fibrillation more than a year old, is in general a contraindication. Heart failure also seems to be a contraindication. It must be pointed out that some patients are particularly sensitive to the drug, and in a few instances sudden death has resulted from embolism occurring suddenly under quinidine therapy. However, in properly selected cases its results scem to be almost magical in restoring normal rhythm to fibrillating hearts. In such instances also it brings immediate marked relief from the disquieting subjective discomfort of the palpitation from which

the patients suffer.

White recommends that patients be digitalized before quinidine is started, particularly if there is any sign of heart failure. His method of treatment with quinidine is as follows: Two test doses of quinidine sulphate of 0.2 Gni. (3 grains) each in capsule or tablet form are given, one at 2 p. m. and the other at 4 p. m. If there are no toxic symptoms from special sensitization to quinine, 0.4 Gm. (6 grains) is given at 10 a. m., 12 m. and 2, 4 and 6 p. m. the following day and the day or two after until the rhythm becomes regular, either because of the onset of flutter or of normal rhythm, or until toxic symptoms appear. If fibrillation continues after this amount has been administered for two or three days, it does not appear wise to give more. If, however, the drug acts successfully, it may be desirable to put the patient on a daily ration of 0.4 Gm. (6 grains). When quinidine is administered, the patient must be carefully watched lest undesired symptoms occur. In cardiac disturbances at least, it is a very potent drug.

#### HEART BLOCK

Complete heart block is due to pathologic changes affecting the system of fibers whose function it is to convey from the auricles the stimulus which causes normal ventricular contraction, Gummas, calcified plaques, or tumors may press on or invade that part of the auriculoventricular conducting system known as the bundle of His. Fibrosis, fatty degeneration, infarcts and inflammatory changes occurring in the bundle of His, and perhaps other portions of the con-ducting system, may also produce heart block. Incomplete heart block, in which the relation of auricular to ventricular rhythm is partially retained, may be due to less extensive changes in the auriculoventricular system, resulting from acute infections such as pneumonia, diphtheria, rheumatism, typhoid or sensis; from lesions of the medulla oblongata or vagus, and from overdosage with digitalis. It is probable that many deaths in acute infections are due to some form of heart block, and are caused by inflammatory swelling

of the fibers of the auriculoventricular system.

Wallace M. Yater, et al. (J. A. M. A., June 10, 1933, p. 1831) say that a review of the literature reveals records of 44 acceptable cases of heart block. A congenital defect of the bundle of His appears to be the cause of this condition in most cases.

Patients with heart block may not present any symptoms except slow pulse and independent rhythm of the auricles and ventricles. This difference in rhythm is determined by comparing the number of pulsations of the jugular veins per minute as observed in the neck with the radial pulse or the ventricular beat as determined at the heart. Syncopal attacks, completing the picture of the Adams-Stokes syndrome, may occur at the onset of complete heart block or at any time after this condition has become established.

If during a syncopal attack the ventricles remain inactive for fifteen or twenty seconds, muscular twitching simulating an epileptiform seizure occurs. If the ventricles are inactive for much longer than twenty seconds, death results. In some cases of complete heart block in which the ventricles beat with their own slow rhythm, independently of the auricles, syncopal attacks may be absent for many years. The ventricular rhythm consists of thirty to thirty-two beats a minute, and when the heart beats at that rate the block is complete.

#### TREATMENT

Antisyphilitic treatment will greatly improve or cure those cases of heart block which are syphilitic in origin, in which the conducting system has not been completely destroyed. Therefore a Wassermann test should always be made. In cases due to other causes, drug therapy offers relatively little help. Digitalis, since it tends to slow still further the ventricular rate, should be withheld except in cases of long standing which have become decompensated owing to myocardial disease. Atropine may be used in the attack, but many who have given special study to the action of drugs in these cases question its value. Iodine in some form, or thyroid substance, is often of value. Rest is important, especially in the cases occurring during acute infections.

Aaron Bell and Harold E. B. Pardee (J. A. M. A., March 17, 1930, p. 1555) found barium ehloride extremely helpful in checking paroxysms of Adams-Stokes attacks. Morphine and absolute rest are the best therapeutics, although dextrose intravenously merits trial. They feel that digitalis should not be used in the early days and is best administered as emergencies arise.

# DISTURBANCES OF THE BLOOD AND BLOOD MAKING ORGANS

Anemia, 508—Primary (Pernicious) Anemia, 513 —Leukemia, 519 — Hodgkin's Disease, 521 — Agranulocytic Angina, 524 — Purpura Hemorrhagica, 525—Hemophilia (Bleeders), 528.

#### ANEMIA

Conditions characterized by a reduction of the oxidizing power of the blood are of two principal varieties. In one of these the corpuscles are only moderately affected, but are less efficient oxidizing agents because they contain a deficient amount of hemoglobin. The number of red cells is only moderately reduced, but the functional power of each cell is far below the normal. The blood when examined by laboratory methods is found to have a low color index. To determine this it is necessary to estimate the number of red corpuscles in a cubic millimeter. This figure is then compared with 5,000,000, the average number of red corpuscles in a cubic millimeter of blood of a normal person, the result representing the percentage of corpuscles. This percentage is made the denominator and the percentage of hemoglobin the numerator, and the resulting fraction is the color index

In chlorosis and secondary anemias the color index is ligh, although the total amount of hemoglobin is much reduced. In pernicious anemia many corpuscles have been destroyed but the individual corpuscle carries more than the average content of hemoglobin. Having fixed the type of anemia, it is necessary to search for any etiologic factor which may favor the reduction of the corpuscles or make them poor in hemoglobin. Until the primary disorder is removed, care should be taken to exclude wasting of cachetic diseases, which frequently leads to secondary anemias which may be incurable. Intestinal worms, particularly hookworm

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and tapeworm, frequently cause anemia, partly by the repeated bleeding and partly by the toxins produced by the worm and absorbed into the blood stream. Other poisons, either extraneous or autogenous, may produce a similar effect, especially the products of mouth infection.

#### TREATMENT

The first step in treatment after removing any discoverable cause is to place the patient under the behavior hygienic conditions and afford as nourishing a diet as no possible. In combating the anemia, of greatest impotance is the improvement of the hygienic condition of the patient by fresh air, smilleht and moderate exercise.

#### DIET

The chief point as regards diet is the necessity of increasing the amount of iron-containing foods; meat contains from two to eight times more iron than such foods as rice and other farinaceous foods. Koessler, Maurer and Loughlin (J. A. M. A., Aug. 14, 1926, p. 476) stated that blood regeneration cannot take place without the presence of vitamin A. The following table gives the percentages of iron in various food substances:

	Contains
100 Gm.	Mg. of Iron
Rice	1.8
Rye	4.9
Wheat	5.3
Oats	
Corn	3.6
Potatoes	4.2
Peas	
Beans	
Apples	
Strawberries	
Cabbage	
Spinach	
Milk	
Beef	
Eggs	5.7
Fish	
Veal	2.7

The diet should therefore contain much animal food, beef, mutton or chicken, and spinach should be eaten frequently. Food may be taken in smaller amount and at more frequent intervals. The advantages of fresh air and sunlight to patients suffering from anemia, and the great value of the openair sanatorium treatment advocated for tuberculosis for these anemic patients cannot be questioned. Patients improve with iron, and they will improve as much with an inorganic iron as with any organic iron. The tincture of the chloride of iron, iron and ammonium citrate, or the reduced iron in tablet or capsule, the pill of the carbonate of iron (Blaud), or the saccharated oxide of iron present a variety of inorganic irons sufficient to meet any indication. The multitude of other iron preparations is not needed and is superfluous. Moreover, as iron is used in chronic conditions over a long period of time, it is not logical to give it intravenously.

Through the stimulation of ampule firms and of many hospitals, the fad of injecting iron and arsenic intravenously has become widespread in private practice. Intravenous injections, as well as subcutaneous injections, are given too frequently. In ordinary anemia or in chlorosis there is no excuse for such methods of treatment. If the stomach and intestines can not chemically prepare and cause assimilation of food irons or drugs containing iron, neither could they care for other forms of nutrition. Some pharmacologists, at least, consider these intravenous injections of iron and arsenic entirely uncalled for. Therapeutically, they certainly are unnecessary. Arsenic injections for all forms of anemia, especially pernicious, are largely superfluous, and as a treatment of secondary anemia they do more harm than good. Arsenic at present, and for a long time, has been overused in the treatment of dicease

No diagnosis may be more difficult or more interesting than that of the cause of chronic secondary anemia, according to Herbert Z. Giffin and Charles H. Watkins (J. A. M. A., Aug. 3, 1930, p. 859). Especial emphasis should be placed on examination of stools for occult blood, and abdominal exploration may be advisable if loss of blood is accompanied by even mild abdominal symptoms.

The results of experimentation on animals, clinical investigation and clinical trial indicate that in the cryptogenetic, chronic hemorrhagic and chronic infec-

tious type of anemia and in those due to dietary deficiency, first place in treatment should be given to a balanced diet. rich in vitamin and hemoglobin building substances such as whole adult liver, whole fetal liver, kidney, red meat, apricots, peaches and prunes together with large doses of iron and 90 grains (6 Gm.) a day of ferric citrate. There is at present no good reason for the use of arsenic, splenic extract, bone marrow, copper or intravenous and intramuscular medication. A thorough clinical test is advised of the fractions described by Whipple and Robscheit-Robbins and their co-workers

Chlorosis is on the decrease, probably because children are now given better balanced diets and therefore are not deprived of necessary vitamins. Also, they are given more sun treatment, which tends to prevent anemias. Consequently, in the treatment of chlorosis the diet should be studied and regulated; digestive ability must be analyzed, and plenty of sunlight and rest given. Focal infection should be sought; it may be present even in a child. If the iron of the food is not utilized by a young girl, there must be some chemical gastro-intestinal disturbance that can be found. Intestinal parasites must always be considered as a possible cause of the condition.

John H. Power and William P. Murphy (J. A. M. A., Feb. 14, 1931, p. 504) found that patients with secondary anemia due to chronic hemorrhage or to chronic chlorosis respond very favorably to treatment with iron in the form of ferrous carbonate. These persons respond equally well when whole liver is given in conjunction with the iron.

Liver extract, the authors state, is of no value in the treatment of these types of chronic secondary anemia. The effect of iron or of whole liver is not increased by the simultaneous administration of liver extract,

Hart, Steenbock, Waddell and Elvehjem (J. Biol. Chem., May 1928, p. 797) reported a series of observations on rats in which they showed that iron was inadequate to bring about regeneration of hemoglobin, but on the addition of a small amount of copper, regeneration took place rapidly.

Milton Smith Lewis (J. A. M. A., April 4, 1931, p. 1134) reported observations on 34 children with secondary anemia, treated with iron and copper. The children were from 6 months to 7 years of age and were given from 15 to 60 grains (1 to 4 Gm.) of sancharated ferrous carbonate daily and from 1 to 2 teaspoonfuls of copper sulphate, 0.5 per cent solution, three times a day. The rate of increase of hemoglobin and red cells was compared during an observation period, a period in which iron was given alone and a period in which iron was given alone and a period in which the iron in combination with copper was more effective in the treatment of nutritional and secondary anemia than iron eigen alone.

## DETAILS OF TREATMENT IN CHLOROSIS

In chlorosis, generally accompanied as it is with amenorrhea, thyroid substance may be given in small doses, as:

 Or:
 Gm.

 B. Thyroidei
 2

 Ferri reducti
 2

 or äägr.xxx

 M. et fac capsulas 20 (dry).

 Sig.: A capsula, three times a day, after meals.

Iron may be given as follows:

| Gm. | Gm. | Fincture ferri chloridi | 5 | fi3 iss | Syrupi acidi citrici | 25 | or fi8 i | Aquae | d 100 | ad fi8 iv

M. et fac capsulas 20 (dry).
Sig.: A capsule, three times a day, after meals.

Or:

B Pilulas ferri carbonatis. (Blaud) No. 20. Sig.: A pill, three times a day, after meals.

If the patient who has chlorosis or anemia does not rapidly improve under this treatment, some undiscovered cause is present, or more radical treatment is needed, such as rest, sun baths, or ultraviolet irradiation. Cod liver oil almost always benefits these patients.

## PRIMARY (PERNICIOUS) ANEMIA

Primary anemia, a term for this condition used more often now, occurs most frequently after 30 years of age. It should be recognized that anemia may be present as an incipient stage of the real disease without giving evidence in the blood of the factors that cause the diagnosis of pernicious anemia to be made. Recent studies on the use of liver extracts and stomach wall extracts in the treatment of this disease indicate that it is related to a deficiency of some vital substance found in these tissues and also to blood formation.

There seems always to be some gastro-intestinal disturbance, and it has long been found that one of the earliest conditions is a diminution of the hydrochloric acid in the stomach. In other words, the more definite disease is probably almost always preceded by achlor-

hydria.

S. E. Dorst (Am. J. M. Sc., August 1926, p. 173) describes a family in which there was a series of deaths from pernicious anemia, while other members of this family showed a low percentage or absence of hydro-

chloric acid in the stomach.

The disease begins insidiously, and the first symptoms are those of weakness and breathlessness. There may be loss of appetite, and digestive symptoms; often there is headache. The tongues of these patients are almost always clean; sometimes they are rather red, but often pale, and Willson and Evans believe that if the tongue is coated, the diagnosis of pernicious anemia is doubtful, These patients are generally not thin, and the color of the skin is characteristic, generally yellowish. The more advanced the disease, the more the discoloration of the skin, even to a brownish condition, sometimes suggesting jaundice or suprarenal disease. In fact, primary suprarenal disease is often confounded with primary anemia. When this discoloration is very evident, urobilin is generally found in the urine. Often albumin also is present. In other words, there are signs of general infection and disturbance of many organs.

William Dameshek (J. A. M. A., Feb. 25, 1933, p. 500) says that in the past few years interest has developed in a new type of primary or idiopathic anemia. This disease, characterized by the presence, usually in middle-aged women, of pallor, weakness, atrophied tongue, brittle finger-nails, achlorhydria, and hypochromic (secondary) anemia, responding readily to large doses of iron and tending to spontaneous relapse has recently been described under numerous synonyms.

W. B. Castle and M. B. Strauss (J. Clin. Investigation, July 1932, p. 809) studied a group of normal pregnant women by observing the blood, the gastric juice and dietetic history. More than half of these women showed a marked hypochlorhydria during pregnancy, with a return to normal following delivery. There was a twelve per cent average hemoglobin loss during pregnancy in these cases as against a five per cent average loss in those with normal gastric contents and diets.

V. C. Rowland (J. A. M. A., Feb. 25, 1933, p. 537) believes that fron in dosages of 90 to 120 grains a day is specific in secondary or hypochromic anemia of pregnancy. This anemia is probably due to dietetic deficiency and faulty absorption of the hematogenic substance on account of gastro-intestinal disturbances. These anemias occur in slight degree in the majority of American women during pregnancy and are associated with hypochlorhydria and a deficiency in the specific intrinsic factor involved in blood formation. The mechanism of hematogenesis ordinarily quite adequate is apparently overstrained by the metabolic overload of pregnancy and likewise by various infections, toxic agents and marked nutritional deficiencies.

The blood in primary anemia is distinctive. There is a law jub color index owing to the increase in the law jub color index owing to the increase in the law jub color index owing to the increase in the law jub color index of the red cells. Willson and Evanse describe the blood conditions as follows: Ani-socytosis and pokilocytosis are always present; if absent, a diagnosis of permicious anemia should not be made. Nucleated red cells are generally, but not always present. There is always leukopenia, with an average of a little over 3,000 white cells. The polymorphonuclear neutrophil cells are diminished almost always. There are no increased eosinophils. The large monomuclears (not lymphocytes) and transitional cells are

essentially normal. Myelocytes are found in 35 per cent of these cases. Platelets are generally normal or

slightly subnormal in number.

E. B. Krumbhaar (Am. J. M. Sr., September 1923, p. 329) declares that "mucleated forms of red cells are sure indication of bone marrow activity, and quantitative comparisons may therefore be used to estimate roughly both the stress of the demand and the ability to supply. The normoblasts may appear in any severe anemia; the megaloblast, or earlier form, is more rarely found, except in pernicious anemia, where it possesses diagnostic value. Numerous macrocytes, presumably coming from megaloblasts, suggest pernicious anemia. Extensive polychromatophilia (young erythrocytes)

also indicates bone marrow activity."

C. A. Doan (J. Exper. Med., March 1926, p. 289) finds that clasmatocytes are increased in number three or fourfold in the bone marrow of individuals with pernicious anemia as contrasted with other diseases. In the spleen, these interesting cells are markedly diminished. In addition to the large number of clasmatocytes that are found in the bone marrow, these cells show extra phagocytosis. The nature of the stimulus is not known, but this finding indicates an explanation of the interesting pathologic anomaly of the hyperactively functioning red marrow in the face of a rapidly progressing anemia. The large phagocytic clasmatocytes destroy large numbers of red cells before they have an opportunity to function, and this destruction of the cells in the bone marrow is sufficiently pronounced to occasion a severe anemia. The reduction of these cells in the spleen leads to the inference that this organ does not take any direct active part in destroying red cells in pernicious anemia.

Fever is not a common symptom in pernicious anemia, but always suggests some disturbing focus of infection. There is almost invariably some intestinal putrefaction, probably aggravated by the lack of hydrochloric acid in the stomach digestion, and this activator of proper intestinal digestion being absent, imperfect digestion occurs. E. J. Stieglitz (Arch. Int. Med., January 1924, p. 58) notes that with primary anemia there is associated impaired renal function, and he finds deposits of iron in the convoluted tubules as perhaps a cause of the renal disturbance. Numbness in the hands and feet is not uncommon; in the later stages the anesthesias, paralyses or ataxias due to lesions in the spinal cord may be encountered.

#### GENERAL TREATMENT

The general care of this condition includes dictetic and hygienic measures, medication and combating of focal, gastric and intestinal sepsis. Rest is always essential in the treatment of this disease, until the red corpuscles have been increased to 4,000,000. If the blood count is very low, transfusion may be done.

The part that the liver has played in disturbances of the blood in pernicious anemia has long been recognized, but it remained for Minot and Murphy to discover the value of the administration of liver substance and liver extracts in primary anemia. In an article by these investigators (J. A. M. A., Aug. 14, 1926, p. 470) they declare that the nutritional composition of red bone marrow is the same as that of liver and kidney, and that liver substance as well as red hone marrow extracts are valuable in this condition. They recommend decreasing the amount of fat in the diet, as it may cause intestinal putrefaction, and advise the iron-containing vegetables and fruits. They recommend each day from 120 to 240 Gm. of cooked calf's or beef liver. Lamb's kidneys are also of benefit. They would give 120 Gm. or more of beef or mutton; 300 Gm. of vegetables; from 250 to 500 Gm. of fruit; 40 Gm. of fat, as butter and cream, and if desired, an egg, and 240 Gm. of milk. They would give dry bread, potatoes and cereals to bring the calories up to between 2,000 and 3,000. They of course advise dilute hydrochloric acid, and would give as much as 15 cc. daily. They expect improvement in two weeks.

Improvement in two weeks. Murphy, Munro and Fitz (J. A. M. A., April 16, 1927, p. 1211) describe the changes in the composition of the blood under a diet rich in liver. The value of kidney, chicken and fish livers as blood regenerators is described by Robscheit-Robbins and Whipple (Am.

J. Physiol., January 1927, p. 271).

Reuben Peterson and his associates (J. A. M. A., March 22, 1930, p. 839) report the cases of 3 patients with pernicious anemia of pregnancy who were treated with a high liver diet or liver extract. In 2 cases transfusions were given. The response to liver treatment seemed to be analogous to that obtained by such

treatment in primary pernicious anemia.

Raphael Isaacs and Cyrus C. Sturgis (J. A. M. A., Aug. 23, 1930, p. 585) treated 39 patients with pernicious anemia with dried, defatted hog stomach, and concluded that it may be used as a therapeutic agent in inducing and maintaining a remission in patients with pernicious anemia

They found that a remission may be induced with 15 Gm. of the dried material, corresponding to 100 Gm. of fresh stomach, and that the remission may be maintained with 7 Gm. of the dried material given daily. However, the safe clinical dosage is 10 Gm. for each million red blood cell-deficit in the red blood cell count. The maintenance dose is 10 Gm. five to seven times a work.

They noted no gross differences in clinical features between the remission induced by liver and that which

follows stomach wall therapy.

Sixty patients suffering from pernicious anemia were treated by H. Millon Conner (J. A. M. A., Feb. 14, 1931, p. 500) with gastric tissue of swine or with tripe. Two were given gastric tissue of swine after failure to improve with tripe. Tripe was the sole form of treatment given to 2. Raw and dried preparations gave equivalent results. The mucosa, the remainder of the stomach after the mucosa was removed, and whole gastric wall were used separately, and each proved effective in the cases treated. The presence of muscle meat was not required to obtain results in 2 patients treated with mucosa without muscular coat or other muscle meat.

William B. Castle and F. H. Laskey Taylor (J. A. M. A., April 11, 1931, p. 1198) found extract of liver (fraction G) usually administered by mouth, suitable for intravenous injection and highly potent in pernicious anemia. Maximal reticulocyte responses were obtained from a single intravenous injection of the amount of extract derived from 100 Gm. of liver. One of the patients treated had failed to respond satisfactorily to the oral administration of a similar extract derived from 3,000 Gm. of liver given over a period cerived from 3,000 Gm. of liver given over a period

of ten days. This method of treatment is suggested as being of value for the very sick patient, or in so-called

resistant cases.

Paul Starr (J. A. M. A., April 11, 1931, p. 1219) insists that patients who receive sufficient antianemic substance to keep the red cell count above five million do not have progressive degeneration of the central nervous system in contrast to those who are allowed to remain even slightly anemic.

P. J. Fouts and L. G. Zerfas (J. A. M. A. July 15, 1933, p. 188) found that the product of the interaction of subminimal amounts of liver or liver extract and small amounts of hog gastric tissue (Extralin), as described by Walden and Clowes (Proc. Soc. Exper. Biol. & Med., April 1932, p. 873) is highly effective in the treatment of patients with pernicious anemia. Twelve capsules of Extralin daily produced a maximal response of the blood and was adequate to maintain the blood at normal levels in the majority of patients. The additional use of iron in large daily amounts is indicated in patients with subnormal hemoglobin values.

Roger S. Morris et al. (J. A. M. A., Jan. 21, 1933, p. 171) found that a single intramuscular injection of concentrated gastric juice (addisin) from swine produced manifestation of intense stimulation of the bone marrow. Blood crises lasting twelve and twenty-four days accompanied by marked reticulocytosis of thirtyfour and forty-four days' duration respectively were observed. This phase was followed by more rapid increase in hemoglobin and maturation of the red cells. Coincident with the evidence of stimulation of the bone marrow marked subjective improvement was noted. Because of their experience they believe it probable that a product can be obtained from the gastric contents of swine of such potency that a single intramuscular injection may be sufficient to bring about a complete remission in pernicious anemia.

It would seem that the discovery by the Boston investigators of the value of liver extracts in pernicious anemia represents the greatest advance that has been made in the treatment of this disease.

The remarkable features of pernicious anemia are the rapid, extensive, severe and pernicious character of the blood destruction and the no less striking powers of recovery under a good regimen when the hemolysis is halted. These powers of recovery should not lead the physician either to become doubtful of his original diagnosis or to believe in and to give too favorable a prognosis. Within even comparatively short periods of time, the patient may suffer a relapse more serious than the original attack and not infrequently fatal.

#### LEHKEMIA

This mysterious disease, the cause of which is probably an infection, is characterized by a persistent increase in the white blood corpuscles. Two forms are known, the splenomyelogenous, in which there is enlargement of the spleen and tenderness over the long bones and sternum and perhaps enlargement of the lymph glands, and the lymphatic type. In the latter form the enlargement of the lymph glands is of greatest significance, the spleen increase being of secondary importance.

În the splenic type there is a large increase în myelocytes. The white corpuscles as a whole are increased, usually exceeding 150,000 per cubic millimeter. The polynuclear forms are greatly increased and eosinophils and mast cells apoear in much greater

number than normally.

In the lymphatic type, the number of lymphocytes is greatly increased, forming from 80 to 90 per cent of the whole. In some cases the total number of white cells is not increased, but the proportion of lymphocytes is much greater than normal.

E. B. Krumbhaar (Am. J. M. Sc., October 1926, p. 519) detares that at times an acute infection may cause a lymphocytosis instead of a polynucleosis, and even myelocytes may appear in the blood. Hemorrhage added to infection may cause increase in the white count, while an intoxication of the bone marrow may cause a leukopenia.

In other words, infections may simulate leukemic pictures, which seems a significant argument for infec-

tion as a cause of recognized leukemia.

Minot and Buckman (Am. J. M. Sc., April 1925,

p. 477) found that the blood platelets in myelogenous leukemia may be normal in number, or "enormously

increased, or greatly diminished." They are generally below normal in acute leukemia and in chronic lymphatic leukemia.

The onset of the disease is insidious, among early symptoms being the splenic hypertrophy, enlargement of the superficial lymph glands, pallor, anemia and dyspnea. Local hemorrhages may appear externally or there may be hemorrhages into the internal organs. An irregular temperature with periods of pyrexia is not unusual. Castro-intestinal upsets with nausea, omitting and diarrhea also occur. In the acute forms of the disease, death may ensue in from four to six weeks.

#### TREATMENT

Probably no problem which confronts the physician is more difficult than the treatment of leukemia. Primarily any focus of infection must, if possible, be eradicated. Rest and a diet based on overcoming the anemia are also essential to successful therapy. As the condition of chief importance is the enormous increase in the number of white blood corpuseles, treatment has been directed toward counteracting this condition and lowering the count.

Minot, Buckman and Isaacs (J. A. M. A., May 10, 1924, p. 1489) studied 166 cases of chronic myelogenous leukemia, and found that most cases occur in patients between 35 and 45 years of age; that the condition is rare below 25 and that about 60 per cent of the cases occurred in males. The onset was always insidious and hard to determine. "Irradiation seems to have little effect in prolonging the lives of these patients," although there is symptomatic benefit, which benefit decreases in recurrences. The patients, however, are able to continue active life longer with irradiation than without it. The duration of life with irradiation is not much greater than when irradiations are noted, from three to three and a half years on the average, with a range of from two to ten years.

The roentgen rays seem to check the growth of the hyperplastic white corpuscle-producing tissues, but overdosage may prove fatal, and too small doses may actually overstimulate these tissues. Although it is uncertain just how the roentgen rays act in these cases,

there is no doubt that remissions occur following exposure of the spleen or of the long bones. The disease is not cured, however, and there is usually a relapse. The action of the rays should be controlled by blood examinations made frequently. Burning of the skin must be carefully avoided. During intermissions from any treatment, the blood count should be taken frequently to note recurrence or relapse.

#### HODGKIN'S DISEASE

Hodgkin's disease is not a disease but a syndrome. Winternitz of the Yale University School of Medicine believes that Hodgkin's disease is not an anatomic entity. "It is a chronic granuloma," he says, "and I am convinced personally that similar reactions may be the result of local or more general irritation from many different causes." O. T. Osborne (M. J. & Rec., Nov. 17, 1926, p. 598) reports a case that had been diagnosed, in April 1924, both as Hodgkin's disease and as lymphosarcoma, which proved to be due to foci of infection. On removal of the foci, the patient recovered.

C. F. Burnam (J. A. M. A., Oct. 30, 1926, p. 1445) believes that Hodgkin's disease and lymphosarcoma are separate entities, the former an infection and the latter a neoplasm.

Minot and Isaacs (Am. J. M. Sc., August 1926, p. 157) note that lymphoblastoma, not dissimilar to Hodgkin's disease, occurring in the abdomen gives intense abdominal symptoms, the exact symptoms depending on the location of the enlargements. There are often fever and skin disturbances. Generally there are gland enlargements, especially in the groins. Treatment is of little avail

Symmers (Am. J. M. Sc., March 1924, p. 313) divides so-called Hodgkin's disease into five groups: 1. With lymph node involvement: (a) mostly abdominal nodes; (b) mostly abdominal and thoracic nodes; (c) mostly neck nodes. 2. Mostly thymus involvement. 3. Mostly splenic involvement. 4. Mostly liver involvement. 5. (a) Axillary involvement following cervical or thoracic lymph node trouble; (b) inguinal involvement following abdominal node enlargement. The bone marrow may be involved. It should be noted that this disease may occur without enlargement of

the neck glands.

The etiology of Hodgkin's disease is still doubtful. Once established, the disease may show remissions, but natients seldom recover and the physician is encouraged if his patient shows latency over four or five years. The disease manifests itself by a lymphangitis, perilymphangitis, and lymphadenitis. In the early stages the process is local, though an increase in the lymphoid cells of the blood is apparent. In the later stages there is definite toxemia and anemia, and still later with wide dissemination, edema and dysphagia. In a complete study of this subject Bunting and Yates (J. A. M. A., June 12, 1915) point out that in the acute forms death may result in from two to four months and in the more chronic forms life may be prolonged up to five years. One of the most characteristic features of the disease is the alternate periods of exacerbation and remission in the intensity of the process. During such remissions the treatment then in use is often given credit for the improvement.

Burnam studied 173 cases, and found that 118 males were attacked as compared to 55 females. He believes that the portals of entry are mostly the mouth and nose, the respiratory tract and the intestinal tract, in the order named. The disease is generally like a chronic infection, the principal symptoms being tumor masses, fever, weakness and pruritus. Of course, all these symptoms may not be present in the same case. Associated disturbances depend on the pressure from the glands causing cough, dyspnea and abdominal pains, depending on whether the mediastinal glands and the retroperitoneal glands are affected. The lymph gland enlargement varies greatly, and large masses are common. Sometimes these masses shrink later. The frequency of the gland involvement is in the following order: neck, axilla, chest, groin and abdominal glands. The spleen is often enlarged. There is frequently increased temperature, but it is intermittent, and sometimes quite high. The joints may ache, and there may be muscle and nerve pains, owing to toxemia, and finally great weakness and exhaustion. Roentgenograms will often disclose the mediastinal tumors. As has been long known. Burnam does not find that the blood can be

relied on for diagnosis, although there is generally a moderate polymorphonuclear leukocytosis. There may be a lymphocytosis. In other words, the blood is typical of nothing but infection, with some subsequent anemia.

#### TREATMENT

When the involvement is primarily cervical, the tonsils, teeth and nasal sinuses are under suspicion until proved innocent. Every focal infection found must be removed. Tonsillectomy is often indicated. If the primary glandular involvement is extracervical, the source of infection must be found and the suspicious lesions appropriately treated. Excision of primarily involved cervical glands should be done as early

as possible.

Roentgen ray therapy was first tried in this disease in the early years of 1900, and Burnam observes that it is now agreed that irradiation is the most successful means of combating this disease. He does not sufficiently emphasize the importance of focal infection as a cause, and of mouth infection as being possibly the most frequent cause. This is probably the reason that the neck glands are usually the ones to be involved. Of course, in each case a surface gland may be removed for investigation. If the diseased tissues are anteriorly located, the glands then can be readily reached by irradiation. It is quite possible that such treatment is the best that can be given. However, when several glands on the surface of the body are involved, the likelihood is that many deep glands are also involved.

Roentgen ray treatment has often given rise to marked improvement, although recurrences seem

inevitable.

As has already been stated, radium treatment is now much used and thought to be of more advantage than

the roentgen ray.

One of the most important parts of the treatment of this disease is rest, fresh air, good food, iron, perhaps red bone marrow, and in certain cases probably liver extracts. Isaac Levin (J. A. M. A., Feb. 7, 1931, p, 421) made a clinical and pathologic study of more than 500 cases of Hodgkin's disease and lymphosarcoma and concluded that both conditions are malignant tumors. He believes that inflammatory lymphadenitis may be a precursor of both conditions. Almost 50 per cent of the cases studied involved the cervical lymph nodes on only one side and consequently were in the early stage of the disease. All the cases ultimately become generalized according to this observer. Therefore, all the other groups of lymph nodes must be considered as potentially malignant. The methods of radiotherapy used must be similar to the methods employed in types of cancer in which metastases in distant regions are common (carcinoma of the breast). This means that not only must the involved area be treated but also those that are potentially malignant.

The patients should be examined at regular intervals to determine how they progress, and the prognosis should always be extremely guarded.

# AGRANULOCYTIC ANGINA

This syndrome was first described by Schultz in 1922, and is also known as malignant neutropenia or pernicious leukopenia. It presents a grave, acute medical emergency. The symptoms consist of sore throat, fever and a diminution of the number of granulocytes. In November 1931, while observing a patient with this condition, F. W. Madison and T. L. Squier (J. A. M. A., March 10, 1934, p. 755) noted a sudden unfavorable change in the granulocyte level, which had been showing a satisfactory response. The granulocytes decreased abruptly, with a marked shift toward immaturity, and the patient became more toxic. Careful inquiry disclosed that he had been given a sedative dose of a barbituric acid derivative on the evening preceding the granulocyte decrease. The authors add that the increase in incidence of agranulocytic angina has paralleled the increase in the use of drugs containing amidopyrine and especially those containing amidopyrine with a barbiturate. In each of 14 patients the onset of primary granulocytopenia was directly preceded by the use of amidopyrine alone or in combination with a barbiturate.

It is believed that amidopyrine alone or in combination with a barbiturate is capable of producing primary granulocytopenia in certain individuals who have developed sensitivity to the drug and that the appearance of the disease may be the result of an allergic or anaphylactoid drug reaction.

C. L. Randall (J. A. M. A. April 7, 1934, p. 1137) maintains that it is the benzene chain contained in the drugs that is responsible for the severe reaction and the disappearance of the granulocytes from the blood.

## PURPURA HEMORRHAGICA

As purpura hemorrhagica is associated with a diminished number of blood platelets, the term throm-bopenia or thrombocytopenia has been suggested. The condition may be acute or chronic. The normal number of platelets is about 250,000 per cubic millimeter of blood, while in this disease they vary anywhere from 100,000 down to almost none. Hemorrhage will occur if they are below 60,000. The capillary walls are disturbed, and hence there are skin hemorrhages.

The name purpura hemorrhagica should not be applied to every disease in which there are hemorrhagic spots (purpura) in the skin, but to the condition formerly known as the morbus maculosus of Werlhof, It is usually characterized by severe small hemorrhages not only into the skin but also into and from the mucous membranes. There may also be constitutional disturbances, such as fever, nausea and vomiting. There may be hemorrhages from the nose, the rectum or from the stomach. The etiology of the condition is unknown. It has been attributed to changes in the blood or to changes in the walls of the blood vessels. Duke has shown that in all the cases of purpura hemorrhagica studied there was a marked diminution in the number of blood platelets. Whereas normally the count is between 200,000 and 400,000, in purpura hemorrhagica it was below 10,000, many of the counts being below 1,000. He found the coagulation time normal and the clot at any bleeding point firm and without retraction. In this way a differential diagnosis could be made from hemophilia, in which the blood platelets are normal in number but the coagulation time is delayed.

The disease is most likely to occur in childhood, up to 15 years of age. It is not hereditary. The health

may be good otherwise, except for a progressive anemia which the bleeding will cause. There is no other disease condition constantly present. The petechiae which occur in the skin are usually small. There may be bleeding from the nose, gums, vagina, kidney, bladder and stomach, and even from the ears. Occasionally such bleeding may be rapidly fatal. There may be fever with the acute condition. Koster (M. J. & Rec., Jan. 5, 1927, p. 23; Jan. 19, 1927, p. 97: Feb. 2. 1927, p. 167) has studied this disease, which he terms essential thrombocytopenic purpura, and notes that Werlhof first separated this from other hemorrhagic diseases in 1735. He finds that enlargement of the spleen is constant in this disease, and there is apparently an increased destruction in the spleen of elements of the blood, especially of the platelets. In fact, it has been suggested that the spleen is the cemetery of blood platelets; therefore, when the spleen is removed, the platelets are allowed to increase. W. J. Mayo (J. A. M. A., Nov. 13, 1926, p. 1609) notes the prolongation of the bleeding time in this condition, as a result of the destruction of the blood platelets. blood clots," he says, "but the clot does not contract normally. In health the blood platelets range from 225,000 to 400,000 for each cubic millimeter. In hemorrhagic purpura they are greatly reduced, and when they are below 50,000 the disease is manifest."

While this disease may run an acure and fatal course, it is more often chronic, especially in young persons, mostly girls. The hemorrhages in the skin or the mucous membranes or elsewhere may be frequently repeated or intermittent. While there is a prolonged bleeding time in these patients, it should be noted that the venous blood will clot. In other words, coagulation time has nothing to do with the bleeding time, although, as Mayo states, the clot does not normally contract. The number of blood platelets in the venous blood, according to Holloway and Blackford (Am. 1. M. Sc., November 1924, p. 723), is slightly greater than in the

arterial blood

In a case of acute thrombocytopenic purpura following an injection of neoarsphenamine, M. L. Rich (J. A. M. A., Oct. 14, 1933, p. 1223) found within three hours after the injection, numerous degenerated neu-

trophilic cells in addition to the thrombocytopenia. It is concluded that neoarsphenamine at times has not only a toxic depressant action on the bone marrow but also a destructive action on some of the circulating elements of the blood.

M. M. Peshkin and J. A. Miller (J. A. M. A., May 26, 1934, p. 1737) report a case illustrating a causal relationship between such drugs as ergot and quinine

and thrombocytopenic purpura.

#### TREATMENT

Splenectomy seems to be the proper treatment for serious forms of this disease but should not be left until patients are moribund. A. P. Whipple (Surg , Gynec. & Obst., March 1926, p. 329) reports on 81 cases, 4 of which were his own, in which splenectomy was done for this disease with highly favorable results. He cautions that after splenectomy infections should be guarded against. Others, notably the Mayos and H. Z. Giffin, report on the value of splenectomy in this disease. It seems best that the patient remain in bed at rest for some little time before the operation is done. Koster notes that after splenectomy there is a rapid rise in the blood platelets, but the number may again fall. He declares that anything that stimulates the bone marrow will increase the number of platelets,

Blood transfusion is indicated with blood from a donor who shows a high count of blood platelets and whose blood is otherwise compatible. In addition to direct transfusion of blood, normal or citrated, or human serum, many have used intramuscular injections of whole blood in doses of 20 cc. Some physicians have injected horse serum and achieved successful results. Max R. Stockton and George C. H. Franklin treated a case of purpura with antivenin with good results (J. A. M. A., Feb. 28, 1931, p. 677). Possibly all such treatments are of the nature of nonspecific protein stimulation.

H. W. Jones and Leandro Tocantins (J. A. M. A., Jan. 14, 1933, p. 83) contend that spontaneous cures are frequent, but careful consideration of the diet should be made, and infection should be eliminated in order that the disease process may not recur. The acute progressive case is best treated by small intravenous transfusions, frequently administered. Infectious processes should be eliminated and the patient placed on a high protein, high vitamin diet. Viosterol and iron should be given by mouth and ultraviolet ray treatment or outdoor life instituted. There are a few patients who fail to respond to any or all the forms of treatment. Splenectomy or ligation of the splenic artery, after proper preparation by transfusion, should then be performed.

Failure in the treatment may be due to large transfusions, improperly administered transfusions, too long an interval between transfusions, or an insufficient number of transfusions to control the bleeding time.

Aside from the regimen of fresh air, good food, rest, and the various tonics described under the treatment of anemia, the use of calcium lactate to increase the coagulability of the blood has many advocates. This may be given in does of 0.15 Gm, or 2½ grains every two hours or 0.5 Gm, or 7½ grains every two hours or on three times a day.

## HEMOPHILIA (BLEEDERS)

Hemophila is a condition, usually hereditary, characterized by a delayed coagulation of the blood and sometimes resulting in death from hemorrhage. The hemorrhage may be spontaneous, or it may be initiated by a cut, bruise or blow. The bleeding is not limited

to any one part of the body.

Hemophiliaes, commonly known as "bleeders," are of the male sex. Female "bleeders" have been reported cocasionally, but not enough evidence is furnished to show that these are true hemophiliaes. The diesase is transmitted through the female members of the families to their male offspring. Such cases can be traced through generations of families, several male members, but not necessarily all, of one generation being affected. Often the hemophilic tendency will make its appearance early in infancy, occuring at birth when the umbiliteal cord is severed.

Various theories have been advanced as to the etiology of this condition. These can be classified under two headings: (1) deficiency in one or more of the blood elements, and (2) deficiency in the elements of the cells of the blood vessel walls. In the first group

the hemorrhage has been attributed to lack of calcium and deficiency of prothrombin, or to an excess of antithrombin. Weil has even claimed the presence of anticoagulants in the blood. On the other hand, it has been asserted that there is abnormal fragility of the blood vessel or that there is lacking in the cells of the wall a fibrin-forming substance—thrombokinase.

Certain factors relating to the blood in hemophilia have been definitely proved. It has been repeatedly shown that the coagulation time of the blood is prolonged. Normally blood will coagulate in from ten to twenty minutes; with the same methods for determining coagulation time of the blood in hemophiliacs, it has been shown that the coagulation time may be prolonged even to five hours. Hess states that the coagulation time should be taken at different periods, since occasionally it may approach normal. It is probable that on the occasions when it approaches normal there is admixture of juices containing thrombokinase from tissue at the site of puncture. Duke and others have shown that the blood platelet count in hemophilia does not vary from the normal, whereas in purpura hemorrhagica it is lower than normal, In exceptional cases, such as one mentioned by Hess, the calcium content has been found unchanged. Howell found a deficiency in prothrombin, the antithrombin being normal or only slightly increased. Abnormal endocrine gland secretion may be partly responsible for this condition.

#### SYMPTOMS

Hemophilia may be unrecognized until hemorhage occurs spontaneously from a simple cause. Profuse epistaxis is frequent; severe hemorrhage may
follow tooth extraction, or there may be bleeding
into the stomach or intestines. The hemorrhage may
be subcutaneous, following blows, resulting in the
formation of hematomas. A well known symptom of
hemophilia is effusion into the joints. The larger
joints are most often affected, particularly the elbow,
knee or ankle joint. This hemarthrosis may first manifest itself by pain in the joint, soon followed by swelling. Occasionally fever is associated with it. The
true nature of the condition is often not diagnosed, a
common explanation being articular rheumatism or

tuberculous arthritis. Operations based on incorrect diagnoses have resulted fatally. If the joints are not opened, but are treated gently by massage or heat, the effusion of blood disappears, often within a few days, or sometimes only after weeks or months. Recurrences may follow, but the tendency for this grows less as the patient becomes older. Following the absorption of blood there may be a partial ankylosis.

## TREATMENT

The treatment of hemophilia up to within a recent period has been as varied as the theories of its cause. Recently it has become more uniform because of successful experiences covering a large number of cases. Treatment may be general and local. It depends to a larger degree on the location of the hemorrhage. If there has been considerable loss of blood, the patient should be supplied with sufficient fluids to help make up this loss. Milk is recommended, both on account of its calcium content and because of its nutritive value. If marked anemia is present, iron in convenient form should be given. This may be administered in the form of saccharated oxide, in a 3 grain (0.2 Gm.) tablet, crushed with the teeth before swallowing, one tablet being taken two or three times a day, after meals; as the reduced iron in 0.10 Gm. doses, in capsules two or three times a day, after meals; as the Blaud pill, 3 grains (0.2 Gm.), two or three times a day, after meals, or as the tincture of the chloride of iron in 5 drop doses, in fresh lemonade or orangeade, three times a day, after meals. As has frequently been stated, there is no advantage in an organic iron over an inorganic iron preparation, and there is no necessity for giving large doses of iron in simple anemia.

Two methods have been tried for directly shortening the coagulation time of the blood. The first consists of the administration of empiric remedies supposed to supply one of the missing factors necessary for coagulation. Calcium in some form frequently is of benefit in these cases. It may be administered as simple lime water in tablespoonful doses, three or four times a day, given in water or milk; or as calcium lactate in a dose of 0.3 Gm. (5 grains) given in some solution three or four time a day. Calcium chloride is perhaps most frequently used, but it is more irritant and of no greater efficiency than other forms of calcium.

Good results also have followed the use of serums. Various kinds have been administered, among which are rabbit, horse and normal human serum. The serum has been used in different forms, freshly obtained from the blood, plain horse serum or weak preparations of diphtheritic antitoxin (when other serum is not available), and solutions of dried serum.

Serum may be administered intravenously or subcutaneously, or applied locally to the bleeding point, if it can be reached. When given intravenously or subcutaneously, proper aseptic precautions should be taken. For intravenous injection, from 10 to 20 cc. can be given every day until the bleeding stops. whereas for subcutaneous injection this dose should be doubled. The intravenous injection has great advantage over other methods, since by mixing intimately with blood it supplies more rapidly the absent elements necessary to increase the coagulability of the blood. When given subcutaneously, the serum must first be absorbed into the blood stream from the tissues, and before this can occur, it will probably undergo a certain amount of change from action by the tissue cells.

Normal human serum, if this can be obtained, is undoubtedly the best to use, since it contains no foreign proteins.

It has been found that following the administration of rabbit or, more particularly, horse serum there occasionally follow definite symptoms to which the name "serum sickness" has been given. These symptoms consist of a rise in temperature and an urticarial rash, the rash often being surrounded by an area of edema. The urticarial rash often fades into a scarlatiniform rash that lasts for several days.

Horse serum or diphtheria antitoxin is a most convenient remedy, as it is easily obtainable. The possibility of anaphylactic shock must be borne in mind and guarded against by first testing the patient with a small dose, as I cc. given subcutaneously. It should be known that the patient does not suffer from asthma or

hav fever from horse emanations.

Whole blood injections should not be given into the veins unless preliminary agglutination and hemolysis tests have been carried out, as for transfusion in other conditions

For some years, investigators have been inclining toward the view that this condition is of endocrine origin and represents a deficiency of the ovarian principle. Therefore, Birch has administered ovarian extracts and there are now available reports of remarkable results following such treatment. The method is still, however, in an experimental stage.

As a last resort, transfusion itself may be tried. The usual precautions should be taken, the blood of both patient and donor being tested for hemolytic and agglutinative properties. A Wassermann test of the donor's

blood should always be made.

As there is a high mortality in hemophilia unless the hemorrhage is promptly and completely checked, advantage should be taken of every available means to obtain serum or to make arrangements for a transfusion. If there is no source from which fresh serum can be obtained, and if for any reason transfusion cannot be done, horse serum or antidiphtheritic serum, which can always be procured, should be injected.

After a hemorrhage the patient is necessarily considerably weakened and may be anemic. He should then have rest and supportive treatment as described

for other blood diseases.

# DISTURBANCES OF THE THYROID

Hyperthyroidism, 533—Simple Struma of the Thyroid, 538—Hypothyroidism (Hyposecretion), 539,

## HYPERTHYROIDISM

The etiology of hyperthyroidism has not yet been determined. There are probably many causes, but among the most frequent causes advanced is focal infection, in the mouth or tonsils. Some patients seem to recover promptly after the removal of the infected tissue.

## SYMPTOMS

Disturbance from perverted function of the thyroid develops insidiously as a rule. At first there are symptoms of a general nervous disturbance. Other manifestations are gastro-intestinal upsets, tachycardia, abnormal sweating, tremors, flashes of heat, signs of excessive mental irritation and, in women, menstrual disturbances.

# LABORATORY TESTS FOR HYPERTHYROIDISM

According to Goetsch, in states of hyperthyroidism there is a hypersensitiveness to epinephrine. A sub-cutaneous dose of epinephrine in an individual with hyperthyroidism is characterized by an early rise in blood pressure and pulse rate varying from 10 to 50 and normally proportional to the degree of toxicity present. There is also moderate exaggeration of the symptoms such as tremor, throbbing, vasomotor changes, apprehension and nervousness. Experience shows that the test is a measure of the sensitization of the sympathetic or vegetative nervous system. Lueders (Arch. Int. Med., October 1919, p. 432) finds it cannot be relied on to any great extent as a diagnostic measure, but there is a considerable difference of opinion.

Tests of sugar tolerance, nitrogen loss and acidosis have been made by Lueders in cases of hyperthyroidism. He believes the latter two are suggestive as aids in the diagnosis. Since the nitrogen metabolism is increased in exophtalmic goiter there is nitrogen loss by way of the kidneys and bowel. The more severe symptoms and the more striking signs of acute toxic goiter are suggestive of acid intoxication with depletion of the blood carbonates. The tests described under diabetes may therefore be applied and may reveal interesting information in cases of hyperthyroidism.

The best recognized test for hyperthyroidism is the basal metabolism determination as developed by Magnus-Levy, Ruber and many others. For this purpose

the special Benedict apparatus is required.

Means and Aub (Arch. Int. Med., October 1919, p. 949) found that the metabolism showed a definite reduction below that of normal individuals of the same age and sex in cases of hypothyroidism and markedly increased metabolism in hyperthyroidism.

To be of value this test must be properly made. For a patient to hustle into the office or laboratory, rest a few minutes, and then have the test taken makes the test of little value. The patient should rest for many hours, without food, before the test. It is best to have the patient rest in a hospital over night and then take the test the first thing in the morning. The rate of the pulse is always indicative of thyroid activity. If there is hyperthyroidism, the pulse will be rapid, and with improvement in the condition the pulse becomes slower. If there is hypothyroidism, the pulse will generally be abnormally slow, and with the increase of thyroid activity the pulse will be rances in speed.

Hugo A. Freund and Warren B. Cooksey (J. A. M. A. June 14, 1930, p. 1891) observe that primary hyperthyroidism frequently occurs in elderly persons without visible or palpable gotter. These patients presented symptoms referable to the gastro-intestinal tract as their initial complaint. The usual signs of exophthalmic gotter are generally obscure; nevertheless compound solution of iodine promptly controls the symptoms. Subtotal thyroidectomy is often necessary

for a cure.

Walter W. Hamburger and Morris W. Lev (J. A. M. A., June 28, 1930, p. 2050) use the term masked hyperthyroidism to designate a group of middle aged, apathetic men and women suffering from thyro-

toxicosis, in whom the classic signs and symptoms of hyperthyroidism are wanting, but who present an atypical clinical picture of some other disease, such as organic heart disease, congestive heart failure, angina pectoris, diabetes mellitus or pernicious vomiting.

The diagnosis of this condition rests on a suggestive increased warmth, redness or pigmentation of the skin; slight staring expression of the eyes; increased restlessness; unexplained loss of weight; persistent increase in the basal metabolic rate; improvement or relief of symptoms, and decrease in the basal metabolic rate follows:

lowing iodine medication and thyroidectomy.

Of 100 cases of hyperthyroidism, S. A. Wilkinson Ir. (J. A. M. A., Dec. 30, 1933, p. 2097) found that 36 per cent had achlorhydria, and the average acidity of all cases was reduced to slightly more than half the normal. After thyroidectomy, only 10.5 per cent show achlorhydria. The theory is offered that the depression of the gastric acidity is a phenomenon of extreme sympathetic overstimulation.

#### TOPATMENT

The treatment of hyperthyroidism is based on two main factors: alleviation of symptoms and removal of the foci of infection which may be responsible. These patients should have rest in bed, freedom from all excitement, and a modified diet for a few days before and after being subjected even to such minor operations as tonsillectomy or extraction of teeth.

Infective Foci.—As already stated, an important factor in the treatment of hyperthyroidism is the removal of the foci of infection. With this in mind, the teeth, tonsils, sinuses, gallbladder, appendix and genital organs should all be carefully studied and then treated as necessary to clear up any infection. The importance of completely clearing up foci of infection is illustrated by the way in which symptoms persist even after partial thyroidectomy when foci of infection are allowed to remain.

Rest.—In the treatment of hyperthyroidism some of the most important general factors are freedom from mental and physical fatigue, and from all excitement. Rest in bed is the best method of obtaining this.

but cessation of work and rest at home are in many cases sufficient. Exercise should be moderate, especially in those instances in which there is more or less tachycardia; otherwise, permanent injury to the heart may result. The digitalis preparations have practically no effect on this type of tachycardia; indeed, digitalis poisoning may result without any slowing of the pulse.

Excitability.—For the general nervous excitability, rest in bed is again the best therapy. Bromides may be used, but they will increase the general debility of the patient, if long continued. Opiates are contraindicated even though they always reduce thyroid secretion. Calcium medication is beneficial.

Dist.—The diet in mild cases should consist of sinple foods the variety of which need not be limited except that it is better to eat little meat. In the more severe cases a meat-free diet is advisable. Tea and coffee should of course be omitted. Caffeine, strychnine and other general stimulants are contraindicated, as they tend to aggravate the nervous symptoms. Dubois found by calorimetric studies that the metabolism of these patients averages one and a half times more than normal. His studies should make it clear that these patients require rest to diminish the metabolism and large amounts of carbohydrate foods to prevent loss of body fat and protein.

Specific Preparations.—Thyroid extract and the crystalline active principles of Kendall's group described later, generally aggravate the symptoms and so are contraindicated. There are a number of preparations on the market that are derived from thyroidectomized animals which seem to be beneficial in some cases. Compound solution of iodine (Lugol's solution) has been found definitely of value in temporarily lowering the basal metabolic rate and is used preoperatively.

Roentgen Roy.—The roentgen ray treatment has been given with excellent results. It should not, however, be used indiscriminately as, if not administered by a skilled roentgenotherapist, serious injury may result. The effect of radium on goiter is quite similar to that of the roentgen ray. Means and Aub found that exposure to the roentgen rayand rest in bed benefited many of

their patients. Coincident with the treatment a reduction in metabolism to 20 per cent of its former level occurred. Holmes and Merrill (I. A. M. A., Nov. 29, 1919, p. 1693) found that exposure to the roentgen ray decreased the activity of the thyroid gland and destroyed glandular structure. It produced relief of the symptoms in thyrotoxicosis. Its effects are estimated through determinations of the basal metabolism. They recommend that the roentgen ray accompanied by rest be tried in all cases of thyrotoxyosis.

Before any treatment of thyroid disturbance is inaugurated, all foci of infection must be removed, more especially the tonsils, as well as foci in the jaws. A careful diagnosis must also be made of the type of thyroid trouble. The frequent condition of adenoma must be distinguished from other forms of thyroid disturbance. An adenoma should generally be removed surgically. There are many subdivisions of thyroid disturbance now classified, but a toxic goiter is easily recognized. When roentgen ray treatments are given great care must be taken not to injure other glands in the neck, and the skin must not be so injured as to make subsequent operation more difficult, or prevent the formation of the perfect scar which is now so frequently the successful outcome secured by surgeons who operate on this gland.

Surgery.—Surgery is much used in the treatment of hyperthyroidism. Ligation of the superior thyroid arteries and partial thyroidectomy are both of great

value in alleviating symptoms.

The thyroid is probably rarely affected without disturbing the parathyroids also, especially when the condition is due to a focal infection. Many of the symptoms of toxic thyroid are due to parathyroid malfunction. Roentgen ray treatment of the thyroid can also disturb the parathyroids, and when operative measures are taken the surgeon must preserve with great care at least two of the parathyroid glands.

#### CONCLUSION

If the trend of the disease is downward in spite of therapy, surgical procedures must be instituted. After operative treatment, the patient requires medical care as much as after an operation for gastric ulcer. Surgical treatment of a thyroid should take place before the heart has become permanently injured. Not only is the heart in trouble from the toxic goiter, but the infection that so many times is the cause of the goiter may also result in endocarditis and myocarditis.

#### SIMPLE STRUMA OF THE THYROID

The cause of simple struma of the thyroid is apparently a shortage of iodine in the water of the region in which the patient lives. School children in certain districts are found to give evidence of such shortage, a large majority of them having enlarged thyroids. It has been repeatedly shown that giving these children small amounts of iodine will prevent goiter. They should receive an amount of iodine represented by 0.2 Gm, of sodium iodide once a day for ten days, every six months.

The only reason for treating the colloid goiter which is not causing any symptoms is to reduce the size of the gland, because it is unsightly. Some colloid goiters become large enough to interfere with degluttion and respiration: in such cases, of course, surgery is indicated. Jodine, iodides and thyroid extract are sometimes effective in reducing the size of the gland. E. C. Kendall's active principle of the thyroid may prove

of value in some of these cases.

Removal of foci of infection may prove of value in the treatment of these goiters. If they are infectious, removal of the foci should at least stop further increase in size and also should make a change to the exophthalmic type most unlikely. So, removal of these foci is indicated even in the simple strumous goiters.

Enlargement of the thyroid gland is of frequent occurrence at puberty, especially in girls. It may represent a previous long shortage of iodine, but it may cocur as a concomitant of puberty, representing an insufficiency of the thyroid gland during the period when many glands change their function. This condition is infrequent in boys. If the girl's maturity is delayed, that is, if menstruation does not occur at the proper time, the thyroid gland frequently needs help, and generally iodine will be of benefit. At times, thyroid extract is needed. When menstruation is

thoroughly established in these young girls, the thyroid

gland generally becomes normal.

Harold Thomas Hyman and Leo Kessel (J. A. M. A., June 13, 1931, p. 2014) declare that therapy in simple goiter is based on the following physiologic principles: Gotter is the result of a deficient storage of iodide in the thyroid gland. Following the chemical deficiency there occurs a hyperplasia of the gland with an increase in the vascularity and bulk. When iodide is again adequately stored there is a conversion from the hyperplastic to the colloidal state with a diminution in the size of the gland. If the storage of iodide is again drained, the gland undergoes a secondary hyperplasia, but when adequate storage is again assured, it reverts to the colloid true.

# HYPOTHYROIDISM (HYPOSECRETION)

Hyposecretion of the thyroid gland may be present in the following conditions, either as a cause or as an accompanying complication:

Chlorosis Amenorrhea

Obesity Goiter Eczema Hysteria (depressant forms)

Vomiting of pregnancy Epilepsy Melancholia Slow growth in children Cretinism Adiposis dolorosa

Adiposis dolorosa Lipomatosis Myxedema Senility

Typical symptoms of hypothyroidea are best recognized and studied in the adult female. If there is a hasolute absence of secretion, myxodema develops, a hormally diminishing secretion, such as overse after 45 or 50 years of age, is shown by symptoms, the most evident being the addition of flesh, espatially deposits of fat, a slowly increasing blood pressure, and a gradual development of connective tissue in various parts of the body. If this secretion diminishes normally as one advances into old age, the skin begins to lose its nutrition and dries and wrinkles, with a tendency to the occurrence of exzemas.

# PRINCIPAL USES OF THYROID

The absence of menstruation, after puberty, without pregnancy or acute or chronic disease, may point to a diminution of the thyroid and ovarian secretions. If the patient is anemic, iron and ovarian extract should be given. If the patient is not very anemic and tends to put on weight, thyroid extract may be used in the treatment. The dose of thyroid should be small, not more than 2 grains (0.13 Gm.), often less, of the dried extract once a day.

There has never been a satisfactory explanation of the condition of chlorosis. Chlorotic patients are generally short on vitamins and often on iron. Possible mouth and tonsil infection should be investigated. For some reason these patients do not metabolize the iron of their food. Large doses of iron and sunshine always cure these patients. If these girls begin to menstruate normally the disease disaspears, and throid extract

acts as an efficient emmenagogue.

The disturbance in metabolism that is most frequently improved by thyroid is obesity. There are several types of obesity, and not all due to thyroid subsecretion, although in most cases administration of thyroid is beneficial. Thyroid extract will probably cause loss of weight in every instance provided a sufficient amount is given. At the same time there is a great nitrogenous loss, and there is always the danger of causing disturbances as a result of increased amount of thyroid in the blood, some of which may be serious. It can cause faintness and loss of strength, and a debility from which recovery may not occur for a considerable length of time. If weight is being added. especially in women over 45 years of age, small doses of thyroid may prevent it. If the fat is already present, it may take considerable dosage to reduce it. The large doses which were once used for this purpose are not justifiable, and a patient under thyroid treatment for obesity should be very carefully watched, and the administration should cease as soon as any unpleasant symptoms appear. When weight is put on in younger life, especially in women, the giving of thyroid and often pituitary extracts is the most efficient treatment, and the dose required is generally not large. The value of combining such treatment with a diet free from sugar, a diminished amount of other carbohydrates and physical exercise should not be overlooked. The dose of thyroid should be 0.2 Gm. (3 grains), at first three times a day for a week, then twice a day for another

week, and after this once a day will probably be sufficient. To be sure that the thyroid is active, 0.25 Gm. (4 grains) of sodium iodide should be administered once during each twenty-four hours. The patient may not begin to lose weight for at least two weeks; after that some weight should be lost every week, and patients may lose weight even after the treatment has been stopped. The loss of 2 or 3 pounds (0.9 or 1.3 Kg.) a week should be considered sufficient and satisfactory, If the excessive weight is hereditary, or has persisted for years, the fat will again return on cessation of the treatment. In these patients great loss of weight will not be caused by the treatment without the necessity for more thyroid being administered than is safe. Patients who are receiving thyroid should be watched carefully for symptoms of excessive thyroid administration. It is well to begin with a small dose and increase gradually. It has been suggested that the recumbent pulse should not be permitted to go above 90. When it does the procedure should be discontinued

#### SIGNS OF HYPOSECRETION

If undesirable fat begins to be deposited before the age of 40, unless there is a marked family tendency to such excessive weight, the thyroid is probably undersecreting. If such deposits of fat occur on the hips, over and under the clavicles, on the upper arms and around the breasts in women, with a feeling of oppression and dyspnea on exertion, and especially if menstruation has ceased, the diagnosis is absolute that the thyroid is secreting insufficiently. If the condition just described develops further, adiposis dolorosa is in evidence, the only difference being that of degree and that the fatty parts are painful. The thyroid is always found to contain a large amount of connective tissue and to be subsecreting in this disease. In the rare instances of general and localized lipomatosis the thyroid is probably not perfectly active, although other signs of its inactivity may not be present. Thyroid extract will always improve the condition of the skin even if it does not inhibit the advance of the disease. In many of these cases there is an abnormal secretion of the pituitary gland; probably most of the posterior lohe

Many eczemas of early childhood are often incorrigible until minute doses of thyroid are administered. These are especially the type that occur around the orifices of the body, and when fissures or cracks in the skin occur. The troublesome eczemas of old age often will not heal with local treatment until small doses of thyroid are added to that treatment. Sometimes the results obtained by such treatment of these patients is most satisfactory.

Hysteria of the melancholic, depressant type, in which there is papthy, unwillingness to talk, and general depression, may be improved and cured by the administration of small doses of thyroid. The border-line between this kind of hysteria and beginning melancholia is hard to determine, but the cerebral stimulation caused by thyroid will sometimes prevent the development of insanity. Whether actual melancholic insanity is benefited by thyroid is doubtful, but it certainly is a treatment sufficiently logical to be tried in every case.

Louis M. Warfield (J. A. M. A., Oct. 11, 1930, p. 1076) observes that mild to severe grades of hypothyroidism are common among persons living in a goiter region such as the Great Lakes basin. All classes of people are affected. A considerable proportion are professional men and women. Both underweight and overweight as well as normal weight are found among the patients. The most important single symptom is an undue sense of fatigue, a physical exhaustion which often leads to a neurasthenic state. Other frequent symptoms are constipation, susceptibility to mild infections such as coryza, various aches and pains and, in women, scanty or profuse menstruation. General abdominal soreness, especially along the colon and in the right iliac fossa, is frequent. Diagnosis cannot be made without evidence of a low metabolic rate, as there are no pathognomonic symptoms or signs for the mild hypothyroid state. Differential diagnosis must be made from other endocrine gland failures, especially suprarenal, posterior pituitary and ovary, and from such chronic diseases as occult and incipient tuberculosis, diabetes, chronic nephritis, pernicious anemia and other blood diseases: rheumatic aches and pains and headaches of the migraine type may be due to thyroid failure. Thyroid extract can normalize only the nutritional needs of the body and should never be used to reduce weight in individuals who have normal thyroid

function

H. G. Poncher et al. (J. A. M. A., April 7, 1934, p. 1132) find that the metabolism of creatine appears to be definitely influenced by thyroid activity during childhood. During the period from infancy until about puberty, creatinuria is physiologic. Hypofunction of the thyroid causes a decrease or complete cessation of creatine excretion, which can be restored to normal after the administration of thyroid extract.

This is accompanied by a corresponding change in the clinical condition of the patient. From a comparison with other diagnostic criteria of hypothyroidism in children, the change in creatine metabolism appears to be an important finding which may be useful in

diagnosis and in the control of therapy.

Hypocholesteremia was found in 12 thyroid-deficient children studied by I. P. Bronstein (J. A. M. A., May 27, 1933, p. 1661). Thyroid therapy definitely lowered the blood cholesterol in these cases in addition to raising the basal metabolic rate and effecting clinical improvement. It is suggested that the determination of the blood cholesterol may be an aid in the diagnosis and regulation of thyroid dosage.

#### THYROID IN PREGNANCY

It is advisable, when a woman has given birth to one or more children who have shown subthyroid activity, to administer thyroid gland substance to her during her next pregnancy. Such treatment is logical, and has been successful in producing healthy children. If it is inadvisable to give small doses of thyroid to a pregnant woman or if its results are unsatisfactory, small doses of an iodide may be substituted when it is decided that the patient's thyroid is not secreting properly.

More or less complete insufficiency of the thyroid in adults causes myxedema. This is a rare disease in men, and occurs in women in more than 80 per cent of all cases and mostly in those who have borne children. It would seem from such statistical facts that the gland

is inclined to excessive atrophy because it has previously been overworked, in women, from the periodicity of its increased secretion on account of menstruation, and from its overwork during pregnancy. The treatment is thyroid extract, and it usually causes all of the symptoms to disappear. The dose should not be large, but if for any reason the treatment is pushed rapidly, the patient should be in bed lest sudden heart failure occur from the large doses of thyroid. As soon as the patient improves, the dose should be reduced: a dose of 3 grains (0.2 Gm.) of the dried gland substance a day is sufficient, and even this may subsequently be given only every other day, or even less frequently. Sometimes the thyroid gland of such a patient may be stimulated or may recuperate, or perhaps a super-numerary thyroid may develop so that active thyroid medication is needed only intermittently.

In operative myxedema in which the thyroid gland has been removed totally, or so much has been removed that the secretion of the remaining portion is insufficient, or in some instances of true myxedema, in which the patient cannot live without continued thyroid treatment, transplantation or implantation of thyroid gland tissue into various organs of the body has been tried. sometimes with success. The same implantation has been tried in cretins, and there are records of success. The younger the patient, the more successful, perhaps, is the treatment, but the whole process of such transplantation is still experimental.

#### CRETINISM

In cretinous children the thyroid is absent, or, if present, either contains a small amount of colloid material or is cystic, and there is almost entire absence of thyroid secretion. The curative action of thyroid in cretinism is a demonstrated fact, and the sooner the diagnosis of cretinism is made, the greater the amount of success which will attend the use of it. Unfortunately the diagnosis of cretinism can rarely be made until the child is from 6 months to a year old. If there is not total absence of thyroid secretion an infantile myxedema cannot be determined until the child is 2 or 3 years old. If a cretin or a patient with infantile myxedema is not treated until he is several years

old, the results of such treatment are much less satisfactory. The dose for an infant cretin is not more than 0.065 Gm, (1 grain) of the official thyroid powder. two or three times a day. If the cretin is older, the dose may be larger. Its unfavorable action is shown by increased cardiac rapidity and loss of appetite. Its favorable action is shown by a diminution of the myxedema; in other words, the puffiness of the skin becomes less and there is an actual loss of weight. The mental nowers should increase, and the hair, nails, teeth and bones should grow normally. The thyroid feeding, as soon as improvement has positively taken place, should then be slightly diminished, and a smaller dose given daily for months and perhaps for years. If unpleasant symptoms of thyroid action occur, the thyroid extract should be stopped for a week and then be again started with a smaller dose

#### UNCLASSIFIED USES OF THYROID

Thyroid has been used with success in some instances of hemophilia and purpura hemorrhagica, as well as in the hemorrhages of the menopause.

It has been used in chronic rheumatism as well as in a thirtist deformans. It has often been successful in gouty rheumatism, especially when the attacks showed a general disturbance of metabolism, such as at one time an asthmatic attack, at another an attack of indigestion, and at another a typical gouty joint attack. Small doses given for a considerable time are often successful in this kind of metabolic disturbance.

Thyroid may act as a diuretic, and it certainly is an antidote to nitrogenous poisoning in insufficient kidney action. Even uremic convulsions are sometimes kept in abeyance by the administration of thyroid. During a uremic attack the dose of thyroid should be large, as 10 grains (0.65 Gm.) of the dried extract three times a day. Such treatment sometimes apparently prevents convulsions and in some instances seems to aid in saving life. It has been of benefit in the treatment of puercraft eclarmost.

Thyroid has been used in various skin diseases, sometimes with success. The indication seems to be to stimulate extra secretion of the skin. If there is an acute inflammation or hyperemia, thyroid would not be used. Conditions in which it has been valuable are the dry chronic eczemas, sometimes in psoriasis and ichthyosis, and in some instances of scleroderma. If not otherwise contamidicated whenever there is

It not otherwise contraindicated, whenever there is excessive connective tissue development in any organinother words, a sclerosis or cirrhosis—a small dose of thyroid daily is of benefit. The dose should be so small that it cannot cause evident signs of its physiologic activity. In many of these instances small doses of an iodide, given daily for long periods, are of equal value.

#### ACTION OF THYROID

The following description of the action of the thyroid extract is taken from Useful Drugs: "Dried thyroid gland acts chiefly if not entirely through a compound of iodine contained in it. When given in therapeutically active doses thyroid causes an increase of the nitrogen in the urine and a decrease in weight; it usually increases the absorption of oxygen and the elimination of carbon dioxide. It is one of the very few drugs which can properly be called stimulants of metabolism. The loss of weight is due mainly to increased catabolism of adipose tissue, although there is an increased breaking down of protein unless the diet contains an abundance of protein. With larger or long continued doses there is a very rapid action of the heart, nervousness, tremors, headache, flushing of the surface, sweating and much more pronounced loss of weight.

#### THE ADMINISTRATION OF THYROID

Unless thyroid is given in large doses to combat an intoxication or toxemia, as in pureprial eclampsia or uremia, a therapeutic dose should not cause any evident symptoms. In other words, if thyroid is to be administered continuously for its continued physiologic effect it should give no more symptoms than dose the normal thyroid secretion. Large doses may cause mausea, dizziness and, if quickly absorbed, faintness. There is probably no direct acute poisoning from thyroid. Large amounts have been known to cause convulsions and even death from shock, by the toxic effect on the heart and the enormous vasodilator effect, as

has been seen in operations for exophthalmic goiter when the thyroid has been too much manipulated and a large amount of its secretion has been absorbed.

The treatment of acute thyroid intoxication would be the hypodermic or intravenous use of epinephrine or postpituitary extract and the administration of atropine and strychnine. Possibly good therapy would be bleeding from one arm while physiologic sodium chlo-ride solution was transfused into the other arm.

Contraindications.-Any symptom similar to those of exophthalmic goiter should ordinarily prohibit the use of thyroid. If during the administration of thyroid excessive nervousness, sleeplessness, palpitation and loss of weight occur, the administration should be stopped. Serious nervous and cerebral excitation should also ordinarily prevent its use.

Official Preparation .- Thyroid, U. S. P., consisting of desiccated thyroid glands, is a yellow powder prepared from the thyroid glands of sheep. It has a disagreeable, meaty smell, and is partially soluble in water. This preparation contains the active principle of the thyroid gland, but its activity depends on the amount of the iodine content, and this is variable. It should contain about 0.2 per cent of iodine. The dose varies from 0.03 Gm. (1/2 grain) to 1 Gm. (15 grains), depending on the frequency and the object for which it is used. Thyroid may also be obtained in tablets which vary in size and strength.

# KENDALL'S PREPARATION

Kendall has isolated two groups of active principles from the thyroid gland, the qualities and characteristics of which he summarizes as follows:

1. By an alkaline alcoholic hydrolysis, the thyroid proteins are broken into many simpler constituents. These may be separated into two groups: The acid insoluble compounds are designated group A; those acid soluble, group B. 2. From group A a pure crystalline compound, containing 60 per cent of iodine, has been isolated. It appears to be di-iodo-di-hydroxyindol 3. Group B contains iodine in some unknown form of combination. It is a mixture containing aminoacid complexes and a low molecular weight, 4. Administration of group A produces in the dog and in the human being an increase in pulse rate and vigor, and increases the metabolism and nervous irritability. This physiologic activity is produced by the compound containing iodine in all stages of purity up to and including its crystalline form. 5. Given in excess, toxic symptoms are produced. The amount of the iodine compound required to produce toxic effects is exceedingly small. 6. In exophthalmic goiter two abnormal conditions exist; first, the secreting capacity of the gland is greatly increased and, second, the reservoir capacity of the gland is greatly decreased. The iodine compound plays an important rôle in the production of the symptoms of exophthalmic goiter. 7. The constituents of group B do not produce any toxic symptoms, but in cases of cretinism, myxedema and certain skin conditions, they exert physiologic activity. This active substance, thyroxine, can now be obtained.

# DISEASES OF THE NERVOUS SYSTEM

Chorea, 549—Epilepsy, 551—Headaches, 557— Sciatic Neuralgia and Sciatic Neuritis, 562— Brachial Neuritis, 567—Painful Feet, 569—Backache, 570—Neurasthenia—Psychasthenia—Hysteria, 579.

### CHOREA

Chorea—also known as chorea minor, Sydenham's disease, or St. Vitus' dance—manifests itself by muscular movements, mental irritability, sleeplessness, troublesome dreams and, perhaps, hallucinations. The age of its most frequent inclidence is from 5 to 15 years, and girls are affected three times as often as boys. Chorea is probably due to an infection, and the frequency with which it follows inflammatory rheumatism and chronic tonsilitis, as well as its common complication of endocarditis, indicates that it is due to an organism of the streptococcal series.

# TREATMENT

As will ordinarily be noted, the child with chorea is anemic, restless and ill nourished—in short, just the type to show a low resistance to infection. The primary indication, in view of this fact and in view of the hyperiritability of the sensorimotor system, is for rest. It may be well at the outset to insist on absolute rest in bed for a few days or weeks. The child should be shielded from sources of irritation such as school work, other children, playing or even much walking.

The diet should depend on the acuteness of the symptoms, whether fever is present and the condition of the patient's appetite. Good milk should be freely given. Meat should be allowed in small quantities only, and such excitants as tea and coffee should be absolutely prohibited. Hydrotherapeutic and physical methods are undoubtedly of great value in chorea. The warm bath is sedative and may be given daily or every other day. When accompanied by systematic massage or graded exercises it may achieve markedly good results.

Patients with chorea should be thoroughly examined and local foci of infection, such as carious teeth or diseased tonsils, should be promptly eliminated. Furthermore, such sources of continued irritation as phimosis, adherent clitoris, otitis media, worms or adenoids should receive adequate attention. Eyestrain should be eliminated

It has been suggested that some of these cases are stimulated by purely mental obsessions. An analysis of the mental processes with free questioning by a physician who has gained the patient's confidence may reveal such a hidden source, and an adequate explanation may be of invaluable aid in clearing up the symptoms.

#### MEDICINAL TREATMENT

Arsenic, as solution of potassium arsenite, has long been a popular treatment for chorea and seems to succeed in some cases, but most patients are probably better off without it. Sodium salicylate in fairly large doses has been recommended for those cases apparently related to relumniat disorders.

The patient's bowels should be kept open and elimination encouraged. The heart should receive special attention, as it is frequently affected in chorea.

If the twitching becomes violent or severe, it should be checked by the use of a hypnotic, and chloral hydrate is generally recommended for this purpose in a dosage sufficient to cause sleep—perhaps 5 grains (0.32 Gm.) every four hours for a child 0 years or upward. After the tremors have ceased and the child is convalescent, iron and copper drugs should be given.

A patient who has recovered from an acute chorea should be subjected to a quiet outdoor life for several months, and school work should be absolutely prolibited. If the chorea has occurred at the time of puberty in girls, all excitement and the strain of school life should generally be forbidden until menstruation is regularly established.

#### EPILEPSY

The convulsions of epilepsy in a typical attack are sufficiently well known not to require a renewed description here. The etiology of epilepsy is unknown. There exists one class of patients in whom the seizures are definitely related to certain traumatic lesions of the skull, brain or meninges, or to some actually demonstrable lesion in the brain. This type of case may often be relieved by operative methods. Another type of epilepsy seems definitely associated with intoxication.

Gowers and others have definitely demonstrated that often there may be a hereditary tendency in epilepsy. A history of epilepsy or of some nervous disease in the family has been established in more than 50 per cent of the cases. The disease is usually at least one generation removed, thus occurring in uncles, aunts and cousins. It is assumed that the disease tendency is transmitted as a mendelian recessive. Given the inherited nervous system defect, another factor or other factors would be necessary to precipitate the seizures. Thus there is a possibility of the transmission of epilepsy in the family. Usually only one child in a family is affected. There is no satisfactory evidence that epilepsy is due to a protein sensitivity. Still other observers are convinced that a state of alcoholism, lead poisoning, or other poisoning in either parent at the time of impregnation may be a cause of epilepsy. Turner has defined as idiopathic epilepsy "a chronic disease of the brain characterized by the recurrence of seizures in which interference with consciousness is an essential feature, associated either with convulsions or transient psychical phenomena, occurring usually in persons with an hereditary neuropathic endowment and eventually leading to more or less permanent mental impairment and dementia." In other words as, stated by Dercum, "One fact is prominent in all this, namely, that epilepsy is not a specific entity but includes many symptom groups which differ widely as to their origin and pathology." Perhaps the most practical view to adopt is that stated by MacRoberts (J. A. M. A., April 10, 1920, p. 1000) after analysis of the whole subject: Epilepsy means a tendency to recurrent convulsions; such a tendency

implies a more or less generalized cortical instability; epilepsy is therefore not properly due to any cause outside the brain.

To sum up, there is no lesion in the brain found in ordinary epilepsy, although late in life arteriosclerosis of the cerebral vessels is a cause. Kidney insufficiency and bowel putrefaction, with more or less statis, are known to cause irritants to appear in the blood that may give rise to convulsions. Eyestrain is a frequent cause of epileptic attacks. Probably the parathyroid glands are always disturbed by anything that causes an epileptic convulsion, and calcium shortage is a factor in cerebral cirtibility.

#### TREATMENT

If the patient is in the midst of an attack, measures should be instituted to keep him from being injured by the movements which accompany the convulsion. It is important that chewing of the tongue be prevented. Immediately after an attack the patient should be permitted to rest and recuperate before any active steps are taken to secure a history or to institute treatment.

When one fit succeeds another in rapid order the patient may die, and the immediate administration of a large dose of chloral hydrate or of bromides, or both, may be considered. The following mixture has been recommended:

	(	Gm. or C	c.	
$\mathbf{R}$		5		3 iss
	Sodii bromidi	10	or	3 iii
	Elixiris aromatici			fl3 ii
	Aquaeq. s. ad	100		fl3 iv

M. Sig.: As the physician directs.

[Each teaspoonful of this preparation, i. e., 5 cc., represents 0.50 Gm. (7½ grains) of bromide and 0.25 Gm. (4 grains) of chloral.]

Chloroform inhalation will serve to stop and prevent these terrific seizures.

#### GENERAL TREATMENT

It is evident that the treatment of the epileptic cannot be successful unless the etiologic factor in the individual case is determined and eradicated, if possible. A study of all likely cerebral causes should be made, including roentgenograms of the skull taken in various positions. If the history of the case or the roentgenograms show that operations on the cranium may be of value, expert cerebral surgery should be done.

The greater the hereditary tendency to the disease, probably the worse generally is the prognosis for complete recovery. Permanent incurable lesions in the brain or meninges make the prognosis bad. importance of intestinal stasis causing absorption of toxins and the curability of such stasis medicinally, mechanically or operatively should be emphasized. The importance of psychic study and psychic treatment of epileptic persons should also be realized.

The necessity for epileptic colonies and public insti-

tutions for the study and care of epileptic persons is now recognized. Progressive steps have been inaugurated by a number of states. Good, clean air and outdoor work or indoor work under the best hygienic surroundings, have been shown to diminish the number of epileptic attacks. It is also well known that such patients as are not idiotic will care for each other during an epileptic attack; therefore the nursing care of these patients in detention colonies is not great.

Constipation must be prevented, and the diet should be such as to cause the least possible production of toxins in the intestine. Generally, the lower the meat diet, the better for the patient, and all foods that contain large amounts of nuclein bodies, such as sweetbreads, liver and shad roe, should be avoided. Milk, eggs, fresh fish, peas, beans, vegetables, cereals and fruits make

the best food for the epileptic person.

It has lately been urged that a ketogenic diet, a diet high in protein and fats and low in starches and sugars. is of benefit in prohibiting epileptic attacks. It is advisable, when there is an opportunity, to individualize a patient's diet by ascertaining, with different foods, the character of the digestion and by examining the twenty-four hour urine and the twenty-four hour feces. In public institutions where a large number of epileptic persons are handled, such examinations are almost impossible. The determination of the amount of indican in the urine, however, is indicative of the amount of intestinal indigestion, and indican in the urine in any amount should cause a change of diet and the administration of foods or drugs that will cause

more profuse movements of the bowels.

Henry F. Helmholz and Haddow M. Keith (J. A. M. A., Sept. 6, 1930, p. 707) during an eight year period placed 272 patients on the ketogenic diet. Among these were 29 patients with symptomatic epilensy and 72 whose cooperation was such that the effect of the diet could not be accurately determined. remaining 171, 30 had been treated for less than a year. This leaves 141 of whom 43 are cured, 32 are improved and 66 have failed definitely to improve. The present percentage of benefits and failures is similar to that of their previous reports. Thirty per cent of the patients are free from their convulsive seizures and 70 per cent are not free. Of the recent patients, 37 per cent are free from attacks and 63 per cent still continue to have seizures. The diet is instituted following a period of ten days' fasting, during which time the patient is given one orange, from 8 to 10 ounces of diabetic broth, and from 4 to 6 bran wafers for each meal. Following this procedure, the patient may be placed directly on the diet prescription. Assuming that the patient is approximately 61 inches (155 cm.) in height, the required total calories for basal maintenance would be approximately 1,600; addition of 30 per cent for energy will allow about 2,000 calories. The food prescription for this allowance consists of 15 Gm. of carbohydrate, 47 Gm, of protein (1 Gm, per kilogram), with 194 Gm. of fat. This prescription will be further modified according to the reaction of the patient. If the weight is normal for the age and height, it will be kept at this level by increasing or decreasing the fat. If the seizures are not controlled after two weeks of rigid adherence to the diet, the fat should be The fluid intake should be restricted to a minimum.

Several observers have reported marked improvement when the use of sedative drugs was combined with a salt free diet continued over a long period of time

It has frequently been noted that epileptic attacks may occur in women at the time of the menopause, or in girls and young women when there is amenorrhea or delayed menstruation. The cause has been thought to be an intoxication caused by the changed metabolism, due either to insufficient elimination of nitrogenous waste products by menstruation, or due to a relative insufficiency of the thyroid gland at these times. for the thyroid is known to have detoxicating power. This inference has been borne out in many instances by thyroid feeding diminishing the number of epileptic attacks, and even curing some cases. It is possible in this polyglandular disturbance of ovaries, corpora lutea and thyroid that the pituitary gland becomes involved, and its disturbance may cause the epileptic attacks. Focal infections, especially of the mouth, may be a cause of epilepsy, hence they should be sought and removed.

#### MEDICINAL TREATMENT

If the patient has an aura preceding his attack, he may be provided with pearls of amyl nitrite, as it has been found in some instances that the attack may be aborted by the inhalation of this substance.

As constipation and intestinal intoxication seem to be important factors in the course of this disease, laxatives should be used as indicated by the patient's condition. It may be advisable to cease feeding for several days, as is done in diabetes, and then gradually evolve a diet under which the patient shows symptomatic improvement.

Lavcock, more than fifty years ago, introduced the bromide treatment of epilepsy.

It probably is not often true that a combination of several bromides act better than one bromide. The main point to remember, as so well emphasized by Clark, is that bromides may do a great deal of harm as well as a great deal of good. Sodium bromide can probably be taken longer without causing harm than can potassium bromide. There is no possible advantage of strontium bromide over sodium and potassium bromide; it is more expensive and is absorbed less rapidly, and more of it is probably lost in the intestinal canal. This has given rise to the belief that strontium bromide causes less unpleasant symptoms than either sodium or potassium bromide. If the dose of either of the last two is reduced, the unpleasant symptoms will be no more evident than with strontium bromide. Ammonium bromide is intensely disagreeable to take, and has no advantage over the sodium and potassium bromide. Calcium bromide and zinc bromide are entirely unnecessary drugs. The other bromides are

not worth mentioning.

The enormous doses of bromides given not only do harm, but are entirely unnecessary. It is probably a fact, as is true of enormous doses of iodides, that only a certain amount will be absorbed and circulate in the blood; the large residue of enormous doses of salts passes out of the system unutilized. It has also been well proved that if sodium chloride is partially or entirely removed from the diet, smaller doses of bromide are effective, because they are absorbed more readily and act more efficiently when there are fewer salts in the system. The smaller the dose of bromide that will cause a diminution in the number of epileptic attacks, the less is the nutrition of the body disturbed, and likewise there is not so much interference with the glands of internal secretion and the blood forming organs and the skin is less irritated by the bromide. Consequently eruptions are less likely to occur, and the less are the kidneys disturbed by not being compelled to excrete large amounts of salts.

It should once more be emphasized that the administration of bromides will probably always reduce the frequency of the attacks, and in some instances may apparently cure epilepsy; but this symptomatic treatment is always to be regretted. In some cases due to nervous irritability when the attacks are the result of some nervous reflex, bromides may be curative; but the future of long bromide treatment means mental

and physical deterioration,

Thenobarbital has become widely used not only in epilepsy but in almost every other kind of psychosis or nervous irritability of the kind of psychosis or the cause of the trouble. It will be not of value in epilepsy, but may do as much harm as too much bromide, sometimes stupefying the patient. The pharmacopeial dose is 0.03 Gm. [45 grain]. A fair sized dose would be two or three times this amount. Enormous doses have been given. The drug in large doses kills by causing respiratory paralysis. No renal injuries or gastric disturbances have been observed followine its ennolyment.

G. Wilson and W. A. Limberger (J. A. M. A., July 8, 1933, p. 110) believe that dehydration may be of service in the treatment of some epileptic patients if combined with other accepted forms of therapy. By itself it is not of much value.

#### HEADACHES

The causes of headaches have been divided by Osborne into several large classes: toxic, circulatory, local and reflex

TOXIC

Fever Autointoxication Intestinal Kidney insufficiency Liver insufficiency

Thyroid disturbance Drugs

CIRCULATORY

Valvular disease Venous congestion Plethora High tension Arteriosclerosis

Anemia Leukemia Lung consolidation

Diminished aeration

TOCAL

Eye inflammations Frontal sinusitis Ethmoiditis Ear inflammations

Meningitis
Exudates into the ventricles
Changes in the cerebral

vessels Tumors Synhilis

REFLEX

Eyestrain Nasal disturbances Aural disturbances Facial neuralgias

Facial neuralgias Uterine displacements (?)

In the first three classes mentioned by Osborne, anything that removes or corrects the serious underlying condition will eradicate the headache of which the patient complains. It is in the fourth class, Osborne believes, that a failure of diagnosis of the cause is most frequently made. It is this class that constitutes about 90 per cent of all cases of headache that come to the physician. It is his belief also that 90 per cent of this fourth class suffer from headache because of some ocular trouble.

# EYESTRAIN REFLEXES

The most constant condition caused by eyestrain is, of course, the headache. This headache may develop slowly or rapidly, may be centered in one eye, one side of the forehead or one side of the head, or may be referred to both eyes. In fact there is no part of the head that may not ache from eyestrain. Very fre-

quently, however, one eye is more likely to be affected than the other, and one eye is likely to be unlike the other eye and be more defective than the other eye. Astigmatism and far-sightedness, or both, are the most frequent causes of eyestrain headache. Weakness of the ocular muscles is another cause.

The pain is perhaps more often in the supraorbital region, but is sometimes in the temple, and may be frequently referred to the inner angle of the eye, especially if there is astigmatism. It perhaps occurs very frequently in this region on account of the overactivity of the superior oblique muscle which endeavors to overcome an astigmatic error. Headaches from defective vision from any reason are likely to be in the occipital region. Especially is this true when a person becomes presbyopic and has no glasses to correct the condition, or has glasses that are insufficient to rectify it. Such headaches most frequently occur in the early morning, and are discovered by the patient on awakine.

Eyes that are defective as ocular instruments are likely to be inherited. Certain kinds of eyes appear in different members of the family, the children suffering the same defect from which the parent suffered. The headache may begin at any age, but perhaps more frequently after a year or more of school work. These headaches are likely to come periodically, perhaps once a week, sometimes once in two weeks, or perhaps only once a month, but with a constant tendency to become more frequent. Sooner or later they become megrin, or migraine, which is typically a headache for a number of hours followed by nausea, vomiting, prostration, sleep and recovery.

The title given to most of these headaches by the lairly is "a bilious attack." They are attributed to overeating, eating at night, eating indiscriminately, or are ascribed to particular kinds of food. If the patient is old enough to decide for himself, he gradually eliminates these items from his diet, until almost every kind of food and drink are subjected to more or less suspicion. He then attributes his trouble to his liver. or finds serious fault with his stomach. If he is constipated, he lays it to that, as he finds that after free catharsis, or at least after such a length of time as

a cathartic will generally act, the headache disappears, He, therefore, thinks it is due to constination. Girls and women with these eve defects are more likely to have headache before or during menstruation, and they ascribe it to that function. The pituitary gland is apparently enlarged just before and during menstruation, and many girls and women suffer headache from this cause, apparently developing slight pressure. Anything that hastens menstruation or that relieves cerebral pressure stops the headache. Others learn that they get these headaches when they are overtired. mentally or physically. Some soon learn to become suspicious of their eyes because of headache following theater-going, card-playing, car-riding, shopping, sewing, or reading too long, or, if they are office clerks. after an extra amount of proof-reading or of mathematical work

After the headache habit has once been formed a neurotic element enters into it, and there is likely to be a cyclic headache, even if the eve defect has been corrected. Therefore a patient who has this habit thoroughly formed will always have headaches more or less, at least until the eyes become presbyopic and focusing for near objects has almost been abolished It is also true that neurotic patients who are subject to high tension and nervous irritabilities are more likely to have headaches from slight eye defects than are more calm and less nervous persons.

Headaches during the menstrual periods are common occurrences and most of them are vasomotor in origin. In such cases there is undoubtedly a disturbance in one or more of the glands of internal secretion. The glands that are most probably responsible for the menstrual disturbance are the ovaries and the pituitary. The latter, and in particular the anterior lobe, is the one usually at fault in these conditions because it dominates the ovaries. If a disturbance in the anterior lobe of the hypophysis is the source of the profuse and frequent uterine bleedings, the hypodermic administration of anterior lobe preparations may help and it may also have a favorable effect on the headaches.

Such headaches may be due to congestion or slight enlargement of the pituitary gland at the time of the

menses. The headaches may also be due to migraine, and in this case the customary treatment for this condition should be carried out even though it is generally unsatisfactory.

All physicians now usually recognize recurrent headaches as due to eyestrain, but a large number do not recognize that the patient may have stomach and heart reflexes without headache which also are due to ocular defect. Dizziness, gastric indigestion, even nausea and vomiting may occur without any headache whatever and still be due to eyestrain. Cold hands and feet, chilly sensations, faint feelings, palpitation, irregular heartbeat and pain referred to the cardiac region so as to cause the patient to believe he has heart disease may be due to eyestrain and be corrected by correcting the eye defect.

# TREATMENT

Patients with migraine are prone to become early victims of the nostrum promoter. The headache cures are as varied, if not more so, as the causes of this symptom. Practically all of them contain drugs of great toxicity or else consist of worthless mixtures with no appreciable effect. Recently acetylsalicylic acid (aspirin) has become the mainstay of the large group of laity who purchase headache "cures" in preference to consulting a physician.

In all case of migraine treatment should comprise: (1) a sufficiency of outdoor exercise; (2) a simple, varied, well balanced diet, and (3) regulation of the bowels so as to produce free. daily movements.

For those headaches due to ocular and reflex conditions, Osborne believes that nothing is more helpful than acetanilid. The dose should not be large and it is well to combine the drug with sodium bicarbonate. While caffeine adds to the toxicity of the coal tar product, caffeine has a useful action in curing a headache of the eyestrain type. If a large dose of a coal tar product is given, the patient should lie down for several hours, it possible. Otherwise, the cardiac depression caused by the eye reflex plus the depression caused by the coal tar drug will produce faintness and more or less temporary debility. While acetyhenetidinum (phenacetin) is perhaps a safer coal tar drug to use, the dose must be so much larger than that of acetanilid that the depression is about the same. With some patients antipyrine, acetylsalicylic acid or pyramidon produces the best result. Some find cold applications to the head of advantage, although with many it causes nausea. Others find hot applications satisfactory. Sometimes a hot foot bath will change the circulation sufficiently to relieve the head congestion. Some patients are cold, and some feel hot, and the circulation on the surface of the body is likely to vary, depending on the intensity of the pain or the occurrence of

Opium treatment for these headaches is undesirable. On the other hand, one is often driven by the very intensity of the condition to the limit of medicinal resources. Sometimes cardiac depression is so serious that it becomes a question of giving either morphine or large doses of alcohol. Patients who have these terrible attacks frequently cannot well stand coal tar products repeated so often, for, unless the dose is enormous, the result of their administration is nil. A morphine or alcohol habit, to say nothing of the frequent acetylsalicylic acid or caffeine habit, may be acquired on account of eyestrain headaches.

Clifford J. Barborka, (J. A. M. A., Dec. 13, 1930. p. 1825) treated 50 patients who were suffering from typical severe migraine with the ketogenic diet. The attacks of 14 patients were controlled. Twenty-five patients were definitely improved. Thus 39 patients were benefited by the diet. Eleven patients were not benefited and the treatment was considered a failure. although a number of these patients were not main-

tained in a state of ketosis.

G. F. Norman (J. A. M. A., Feb. 17, 1934, p. 529) studied a number of cases of typical so-called idiopathic migraine and found the blood calcium values uniformly somewhat depressed. The entire group were benefited by means taken to raise the values of calcium to normal.

It is hardly necessary to mention the reflex head pain that may come from a bad tooth, from an inflammation in the antrum of Highmore or the frontal sinus, or from inflammations in the ear, as recognition of

these causes of headache should be easy.

It should be remembered that frontal headache is

frequently caused by syphilis.

It should also be remembered, if there is insufficient pulmonary ability, whether from tuberculosis, emphysema, pleurisy with effusion, or asthma, that this lack of proper aeration may cause headache.

At times gastric hyperacidity and uterine displacements may be reflex causes of headache, but such

causes are rare.

The wearing of tight hats may be the cause of headaches in girls and young women, to say nothing of the pernicious spotted veil.

#### For headache:

		Gm.		
B		20	or	3 ss 3 v
	Sodii bicarbonatis	10		3 iis

M. et fac chartulas 10.
Sig.: One powder in half a glass of water, and repeated

in six hours, if needed.

[In order that these powders may effervesce well they must be kept dry.]

# Or:

Ŗ	Acetphenetidini Caffeinae citratae Sodii bicarbonatis	Gm. 1 50 25 or	gr. xxiiss gr. iv
	Acidi tartariciāā	5	gr. lxxv

M. et fac chartulas 5.
Sig.: One powder, in half a glass of water, every three

[In order for these powders to effervesce well they must be kept dry.]

### SCIATIC NEURALGIA AND SCIATIC NEURITIS

While the sciatic nerve or its branches may transmit painful sensations, the nerve itself may not always be affected, as pathologic conditions of the hip joint (arthritis, tuberculosis or tumor growth, as sarcoma) may cause pain down the sciatic nerve.

As with backache, a patient who has sciatic pain should be carefully examined to determine, if possible, the cause. True sciatica is generally a perineuritis, from which this nerve suffers more than almost any other nerve of the body. Sciatica may be either acute or chronic. In the acute form it is perhaps the cause of more continuous and repeated suffering than almost

any other curable disturbance.

Hunt offers a classification of sciatica which suggests etiologic treatment. Unless the source of the pain is removed, the nerve will continue to develop symptoms. According to this classification, the causes of neuritis are:

 Intrapelvic disease, such as specific exudates within the pelvis, venous congestion, pressure from a pregnant uterus, new growths, and a loaded rectum.

Constitutional states, such as syphilis and alcoholism.
 Damage to the nerve trunk from injury or exposure to cold.

4. Damage to the sacro-iliac joint.

The most frequent cause of sciatica in women is pelvic disturbance and pelvic pressure. In men a neumatic and gouty tendency is frequently an associated factor, and exposure to cold seems to be a frequent exciting source. A possible important factor in the development of sciatica is the compression of the nerve against the tuberosity of the ischium by asymmetrical sitting on a hard seat.

The disturbance of equilibrium caused by a weakened plantar arch or other foot trouble must be considered, as well as the possibility of a heavy patient lying in bed too long on one side, and thus creating pressure in the region of the hip. The springs of the bed and mattress, with extra pillows and cushions if necessary, should be so arranged as to relieve all nos-

sible continued injury to the sciatic nerve.

When the cause of the disturbance is considered to

When the cause of the disturbance is considered to be a general one, a possible focus of infection should be sought. A frequent source in adults is infection in

and around teeth, or in a tonsil.

Besides syphilis and alcohol as causes of sciatica, diabetes and malarial poisoning should be considered. Impaired circulation in the legs, from varicose veins or from insufficiency of the heart, may perpetuate sciatica after it has once started, and treatment in such instances must be directed toward improving the circulation.

# SYMPTOMS

It is hardly necessary to refer to the symptoms of neuritis of the sciatic nerve. Often a patient can map out the course of the nerve by describing where he feels pain, and if not pain, where he feels twinges or peculiar sensations of irritation. There may be, after some days of a real inflammation of the nerve trunk regions of paresthesia in different parts of the leg supplied by branches of this nerve, and still later there may be impaired mobility of some muscles. The pain may be so severe as to be tearing or boring in character, and there may be attacks of cramps or contractions of one or more muscles accompanied by intense pain. There may be some reddening of the skin along the course of the nerve, local elevation of temperature, and rarely some edematous symptoms. The electric excitability may be increased at first, and later reduced. patellar reflexes are normal to begin with, and later may be diminished. Occasionally a herpes may occur there may be some local sweating, showing trophic disturbance. In chronic sciatic pain, the sensation may become almost a habit or a condition expected by the patient, so that the general neurotic condition must be treated more than the local pain.

#### GENERAL TREATMENT

Besides removing the cause of sciatica, if such is possible, the general treatment is important. The diet should be modified according to the systemic condition. In some instances meat should be problished. In other instances it should not be withdrawn; in fact, protein should be pushed and mutrition increased. Constipation should always be prevented. The treatment may be started with a brisk purge, by castor oil or calomel. The bowels should be moved daily, with salines if there is plethora, overweight and a good heart, and with vegetable laxatives if the patient is underweight, anemic, or has poor circulation.

Rest of this nerve is of primary importance, even if there is only a neuralgic condition, an irritation without a neuritis or perineuritis, and it is imperative when there is a neuritis or perineuritis. A neurotic habit of the individual should always be noted. If such is present, this pain, like any other, will be more difficult to combat, and the main treatment should be toward the general condition, whether neurasthenia or

hysteria. Like any other painful nerve, it must be kept warm. Warmth is one of the most important elements

of local treatment.

In acute inflammations of this nerve the pain is so severe that generally morphine must be given. But before morphine is resorted to, the leg should be immobilized and sometimes made rigid with a long splint. It is ordinarily best not to give atropine with morphine, as atropine acts only on the peripheral endings of nerves. In this case the nerve trunk is in trouble, and the atropine will combat somewhat the sedative action of the morphine. Also the morphine may have to be repeated more frequently than it would be wise to repeat the atropine. When the pain is not sufficiently severe to require morphine, antipyrine will sometimes act as a valuable sedative; also salicitin (novasprin), especially if the patient is rheumatic, or cinchophen

# LOCAL TREATMENT

Besides the local treatment already suggested, dry cupping and cauterizing, and at times blistering along the course of the nerve, may be not only of temporary but also of permanent benefit. Sometimes the d'Arsonval current or diathermy is of value in subacute and chronic cases. Sooner or later, gentle massage is advisable.

When this nerve is somewhat stretched and at rest, especially when the leg is surrounded by dry heat, as by hot sand bags or electric pads or such methods of applying heat, excruciating pain may entirely cease. Such patients are fortunate, as narcotics need not be

given.

If a rheumatic condition is present, large doses of salicylates are of benefit. Alkalis are frequently of service, such as potassium citrate in 2 Gm. doses, in wintergreen water, given three or four times in twenty-four hours. If there is nervous irritability and considerable cerebral irritation, bromides are of value, but they should be soon discontinued, as they interfere with nutrition and are very depressant, and calcium preparations should be substituted.

Sometimes warmth is well applied to this nerve by a cradle containing electric lamps, the resulting local sweating, once or twice a day for fifteen minutes to

half an hour, being beneficial.

High frequency currents have been applied to this painful nerve, sometimes with good results. Diathermy may be of great benefit. Often electricity in any form is not well tolerated.

Ethyl chloride spray along the course of the nerve or on different painful regions of the nerve has been

reported to be successful in modifying the pain.

Salt solutions, occaine solutions and eucaine hydrochloride solutions have been injected around the nerve sheath in prolonged acute and subacute cases, with considerable satisfaction. The injection system with sterile water or sterile physiologic sodium chloride solution is an old treatment, recently revived. This routine is not advised in every case of sciatic pain, as many persons are benefited and recover with ordinary local and constitutional treatment; but when the inflammation and pain persist, it is perhaps the most successful therapy. The technic is very difficult and usually best left to the specialist.

Eucaine has been used as an infiltration injection in a strength of 0.1 per cent solution and 100 cc. in bulk. Cocaine has been used in 1.5 per cent, 2 cc. in bulk, followed by 100 cc. of physiologic sodium chloride

solution

Injections of small bulk into the sheath of the sciatic nerve, called nerve blocking, have been done frequently in the severe forms of sciatica. Plain, cold water has been used, as have also cocaine and sometimes morphine solutions.

Whenever injection therapy is done, the treatment should be considered radical, and should be done by one who has become proficient in this operative therapy, as

sometimes uncomfortable symptoms develop.

The injection of alcohol has been shown by Cadwalader to be unjustifiable, as alcohol destroys nerve tissue. He found that injection of salt solution into the sciatic nerve did not result in any degeneration, while strong alcoholic solutions caused destruction of nerve tissue.

Rosenbeck and Finkelstein found that only 20 per cent of patients with sciatica could be relieved by injec-

tions into the nerve or its sheath.

Stretching the sciatic nerve has been recommended for many years, and is sometimes of great value in relieving pain, especially if the nerve and leg are then put at rest, allowing the inflammation to heal. This may be done nonoperatively, by extending the leg in various directions and thus stretching the nerve.

#### BRACHIAL NEURITIS

Brachial neuritis may be produced by any of the chronic constitutional poisons, such as lead, arsenic, alcohol or tobacco; by uric acid disturbances; by altered metabolism of proteins; by insufficiency of the kidneys, by diabetes and, most frequently, by mount infection. It may occur also from straining or injury to the brachial nerves or the brachial plexus. Lying on the arm at night frequently produces a brachial neuritis. The pain is particularly excessive in the neuritis occurring in diabetes, but it may be severe from any cause. Pain shooting down the brachial nerves may be due to pressure from neighboring structures, as when there are rudimentary cervical rils, or a subdetloid burstis.

The primary treatment depends on the etiology, and as in scatica and in backache, a complete history should be secured and a careful examination of the patient should be made to determine the predict patient should be removed, if using factor. This should be removed, if using the When the neutritis is due to some general possoning, and perhaps always unless the patient is greatly debilitated, purging on several days, or alternate days, with a complete change in the diet, is a beginning treatment that may be valuable. Anything that causes pressure or injury to the brachial nerve or the brachial plexus must be removed before treatment will be at all stacessful. Any occupation or use of the arm that perpetutaes the trouble must case.

In rheumatic and related conditions, a course of sodium salicylate followed by a course of alkalis in conjunction with a vegetable and cereal diet will often be of rapid benefit.

If the pain is so severe as to prevent rest and sleep, the temporary use of narcotics may be necessary, and some hypnotic is often advisable, at least for a short time. None of these depressants, however, should be long continued.

A patient with brachial neuritis rarely needs to go to bed; if he carries the arm in a sling he will get comfort and rest for the nerve, and have much less pain. The sling should support the elbow so that the arm will not drag on the painful muscles. At night, or at periods during the day, dry heat, as represented by an electric pad or a hot water bag, is of benefit. As in treating any other sore or painful nerve, the region should be kept warm with flannel or cotton. Sometimes gentle stroking upward, or massage along the course of the nerve to promote the flow of the lymph in the lymph channels, is soothing and relieves local congestion. Later, the arm may be extended and stretched, by the physician, in different directions. This stretching of the nerve seems not infrequently to relieve the pain and hasten recovery. This may be done daily or every second day for some time. Between treatments the arm should be at rest, until the acute and subacute stages of the inflammation are over.

Dry cupping of the tender nerve, especially as soon as the acute stage is over, is at times of benefit.

as the actue stage's over, is act most obscura-Either the d'Arsonval or the Oudin form of high frequency current has been recommended for brachial neuritis, as they sometimes lessen the pain and are of value in hastening recovery. The treatment should be applied locally by a glass vacuum electrode, and the electrode should be passed over the whole region of pain for a few minutes to begin with, and for not more than ten minutes at any one time, at first daily, and later less frequently. Diathermy is of great help in quieting the patient and aiding recovery.

Whenever vacuum electrodes are used close to the skin is covered, sometimes the current will be used longer and stronger than is intended; one is better able to observe on the bare skin the effect of the electric current. After one or two treatments the susceptibility of the patient's skin to irritation will be recognized, and the dosage and intensity subsequently modified to fit his needs.

Active massage is also beneficial in these cases, and the same is true of polarization with the constant or galvanic current for a few minutes, one electrode being indefinite, and the other, generally the negative, being active over the muscle for a few minutes.

When all acute symptoms of neuritis have ceased. or the acute pain and inflammation in a muscle have disappeared, and yet there are recurrent aches, with more or less impaired motility, massage and mechanical vibrations are of value in completing the cure. If there is paresis or semiparalysis of one or more muscles, electric treatments are essential. If the shoulder joint has become impaired in its motion and function by the long continued inactivity, or adhesions have actually formed because of disuse of the joint, active breaking up of the adhesions must be done. If too painful, this may be accomplished rapidly under anesthesia. Less active, but repeated passive motion of this joint may be needed, the joint tending to gain increased motility day by day until it becomes normal. The patient should also daily use the arm to a certain extent and then rest it, if necessary, in a sling, for the remainder of the day, until he is able to use the arm without causing pain afterward.

# PAINFUL FEET

Painful feet have been discussed by many writers as a separate disease condition. Of all the orthopedic ailments affecting mankind, painful, aching feet are perhaps the most common. Frauenthal has suggested that when the pain comes on acutely it is due either to an injury or to an infection; when the pain comes on gradually, there is some relaxation of ligaments or supporting structures. He deplores the promiscuous use of foot plates, some of these metal supports doing more harm than good. A properly fitting shoe is the first essential to comfort of the foot. An aching arch may not be broken or may not have fallen, and may not need a support. All it needs is a proper adjustment of the heel to the foot tread and a proper arch to the shoe. Also, pain in the forward part of the foot is often not caused by a weakened arch, and an arch support will not correct pain in other weakened joints or ligaments. On the other hand, when the arch has fallen or has become weak, and there is a rotation of the ankle inward, besides a proper fitting shoe felt pads under the arch or support that fits the foot and corrects the deformity may and will often entirely relieve the pain in the foot and the associated pain of

the leg and back. Various exercises of the foot muscles may strengthen the arch and later allow of the

removal of this artificial support.

Another frequently overlooked cause of sore feet and pain and tenderness of the ball of the foot is the modern popularity of dancing. A few anatomists call attention to sesamoid bones as being normal in this region of the foot and especially likely to be present at the metatrsophalangeal joint of the great toe, namely, the ball of the foot.

By studying a series of roentgenograms of normal feet and of feet that are painful in this region, Barnes has found that the sesamoid bone is part of nature's method of protecting this joint and of causing normal tread and normal support. He also finds that this sesamoid bone may be fractured or may become injured and not only cause pain from its own disturbance, but incite pain in the joint above it. He orders shoes made with a depression in this part of the sole, which results in comfort and the subsequent cure of this disability. In acute injuries of this region nothing will be of so much benefit as rest.

At times irritation or injury may cause an exostosis to occur in this locale, which of course can be cured

only by surgery.

Much footache in women is now caused not only by high and insufficiently wide heels, but by the binding of the straps and the top of the shoe over the bones and thin tissues on the top of the foot. The circulation is so poor in this part that within a few hours, with most women, large puffs of tissue appear between these straps. This universal unnecessary condition is little less than asinine. We have deplored the Chinese binding female feet. In this age, though the woman's body is now exempt from all the handicaps of tight clothing, her poor feet have become the sufferers for the whole body.

Bony spurs on the heel are a frequent cause for pain in the heel.

#### BACKACHE

The therapy of backache may belong to the domain of the neurologist, the surgeon, the gynecologist or the genito-urinary surgeon. Backache is a common symptom of innumerable disorders. It can be treated rationally only after the correct diagnosis is made. Unless this is done, any improvement resulting from the treatment is similar to that following any hit-or-miss therapeusis.

#### DEFINITION

By backache is usually meant lumbar pain beginning at the region of the first lumbar vertebra and extending downward, often to the sacral and coccygeal regions. The pain may be in the center of the back, along the spine, or on either one or both sides of the spine.

### ETIOLOGY

Often the clue to the real cause of the pain may be obtained by careful questioning. The duration and nature of the pain, its exact location, whether in the center or to one or both sides of the spine, are all of importance. It is essential to know whether or not the pain is associated with fever; has followed a convalescence from some infection; is associated with pain on urrination or with changes in the appearance of the urnie; has followed a sudden strain; is aggravated by bending the body in any direction, or has any relationship to mentrual or uterine disturbances.

After a careful history of the patient has been recorded, a thorough physical examination is necessary in the search for the etiologic factor in the backache. On account of the large number of varied causes, treatment without examination is guesswork. The best way to examine the patient is to remove his clothing, and to observe him first in the standing position, noting whether or not the body is flexed to one side or the other, or more weight placed on one leg than on the other. The presence of any abnormal curvatures or deformities of the spine, or any enteroptosis should be noted. In palpating, points of tenderness should be sought over the spinous processes of the vertebrae, and the presence of ptosed or enlarged abdominal organs should be recorded. The patient should flex the body in various directions while in a standing position and should be requested to flex and extend the thighs on the abdomen while lying on the back, that the freedom of these motions and the amount of pain they cause may be observed. In women a vaginal examination is essential for the detection of any abnormal uterine conditions, such as marked retroversion or tumors of the uterus, or any pelvic exudates or abnormalities.

Roentgen examination of the spine will often be of service in revealing thickening or ankylosis of the vertebral joints or rarefaction of the bodies of the vertebrae. It will also aid to exclude renal or ureteral calculi. Finally, the temperature and urinary conditions may assist in deciding the cause of the trouble.

### BACKACHE DUE TO STRAIN OR LACK OF BALANCE

By far the greatest number of backaches belong to the fatigue and lack of balance group. This type has been described by Reynolds and Lovett as due to loss of balance, when an unusual strain is placed on the lumbosacral tissues and the muscles of this region. The strain may be produced by posture, by poor muscular balance and by abnormal conditions within the abdomen, such as enlargement of the organs, enteroptosis and obesity. The fatigue may result from an attitude constantly assumed in some form of occupation, such as stooping or bending, or from lifting heavy objects.

Those backaches resulting from changes in muscular balance due to uncorrected broken or fallen arches of the feet, or to the continuous use of poorly fitting shoes, are also placed in this group. The pain in these cases often extends up the lower extremities to the back. From a faulty tread, the muscles of the leg, thigh and lower, part of the body may be strained and become painful, and even the knee joint or hip joint may be strained by the lack of balance. A careful examination of the shoes, feet, and posture on standing and walking, and an investigation of the work or the kind of strain to which the patient is subjected, will generally disclose the physical cause and the consequent treatment of this tree of backache.

As a result of the constant backache or frequent attacks of backache, there may come a time when, in the highly neurotic individual, the mind is frequently concentrated on the back, and as a result pains will be present without any organic cause. Associated with this may be other symptoms, such as perverted heat and cold sensations, an abnormal state of the reflexes indicating a neurasthenic tendency. This condition has

been termed "hysterical spine" or, after railway acci-

dents, "railway spine."

The treatment of this form of backache will tax the energies of the therapeutist. No definite rules can be laid down, except that all other possible causes of the backache must be excluded before a diagnosis of hysterical or railway spine is made. In these cases, treatment should be mainly general, and should be based on efforts to relieve and cure the neurotic condition of the patient. Local treatment is usually only of psychic value, but for that reason alone is essential. In local treatment, use may be made of electricity, diathermy, vibrations, electric light heat, spinal douches, or other hydrotherapeutic measures, and even at times the thermocautery will be found of benefit. Hypodermic injections of water into the painful regions may be efficient. The general treatment calls for increased feeding, massage, and regulated exercise, with periods of rest. Occasionally, bitters may be indicated.

### BACKACHE DUE TO INFLAMMATION OF NERVES

To this type of backache belong those due to disturbances of the nerves or to involvements of the posterior nerve roots with their nerves. This includes neuritis, simple or part of a multiple neuritis, resulting from alcoholism, lead or diabetes. Removal and elimination from the system of the alcohol or lead is the first aim of treatment in the first two instances, and in the case of diabetic neuritis, the pain will be ameli-

orated by proper diet.

The acute pain of the neuritis must be stopped, and if local sedatives, as heat, rest and support by straps or otherwise, do not give immediate relief, a drug sedative must be given, with full recognition of the fact that probable prolonged or recurrent backache is likely to cause repeated need for the narcotic. Hence the possible formation of a drug habit. Occasionally the pain is so severe that morphine with atropine must be given; the latter dulls the endings of the peripheral nerves. If the pain is not so severe, or if it is modified by one or two hypodermics, then large doses of sodium salicylate may be tried, as 1 Gm. once in four hours for a few doses. In some instances large doses of quinine may be efficient, as 0.4 Gm, three times

a day for a few doses. If either a salicylic preparation or quinine is pushed to physiologic effect, a bromide should be given synchronously to prevent the uncomfortable salicylism or cinchonism, respectively. Fivetenths gram of sodium bromide may be given for each gram of salicylic acid, and 1 Gm, of sodium bromide for each 0.3 Gm. of quinine. When there is insomnia without severe pain, chloral hydrate in doses of 0.5 to 0.6 Gm. may be given at bedtime. Soluble barbital (veronal sodium) in doses of 0.3 Gm. may be given to induce sleep, if there is no severe pain, Local applications of gentle high frequency electric currents may be tried, or the arc lamp treatment, with later dry cupping, and perhaps the thermocautery.

In posterior ganglionitis with herpes, if there is considerable pain, the treatment may be much the same as in simple neuritis. If the pain is not too severe, a narcotic is not needed. Generally rest and soothing powders and absorbent cotton placed over the eruption, with supporting adhesive straps to limit motion. ease the pain,

#### BACKACHE DUE TO INFECTION

Many backaches are due to changes in the bodies of the vertebra or in the intervertebral joints. When the joints are involved, the pain may be due to an acute infectious arthritis or to chronic hypertrophic arthritis (ostearthritis). Both are associated with a primary focus elsewhere; the acute condition may be part of an acute infection, such as acute follicular tonsillitis, tooth infection, pneumonia, gonorrhea or influenza. When these causes are present there will also be symptoms of the primary infection, such as increased temperature. The involved portion of the spine may be exceedingly tender. Generally this kind of backache disappears with the subsidence of the primary infection.

Hypertrophic arthritis (ostearthritis) develops slowly, often lasting several years and resulting in a thickening, and sometimes in a union of the vertebrae and cartilages. It is caused by a constant source of infection, the commonest being repeated tonsillar infections, pyorrhea alveolaris and chronic gonorrhea. It may be associated with arthritis deformans of the extremities. The diagnosis is assisted by roentgen examinations of

the spine.

The treatment consists in removal of the primary source of infection, if it can be located. Diseased tonsils should be removed, and alweolar pyorrhea should be treated. An abscess in or around the roots of the teeth should be sought by means of roentgenograms, and if an infected tooth is found it should be removed.

If there is any history of a former venereal infection, in the male, a careful examination should be made of the whole urethra, the prostate and the associated organs, and any part found infected should receive proper treatment. In females pelvic disease, if

present, must be controlled, if possible.

Vaccines have sometimes been found of value, especially when they have been prepared from organisms isolated from a primary focus. Until the source of infection is eradicated, local treatment of the back is discouraging, although some relief from the pain may be given by applications of heat, counteriritation and

strapping.

Two common causes of infection of the bodies of the vertebrae are tuberculosis and typhoid. In tuberculosis the backache first manifests itself when the destruction has progressed to such an extent that a gibbus, or bending, of the spine has resulted, and with it pressure on the nerves has occurred. In the treatment of this condition, spinal support and spinal rest, as furnished by a brace or a plaster cast, should be used. Later, after the disease has become quiescent, the destroyed bone tissue may be successfully repaired by plastic bone surgery.

The so-called typhoid spine occasionally develops after convalescence from typhoid. The pain is localized, and may become severe. It does not produce angulation and the deformities characteristic of tuberculous involvement of the spine. The spine is rigid and tender, and there is often fever. The condition is usually self-limited. Proper rest and simple local and general measures usually result in recovery.

general measures usually result in recovery

### SACRO-ILIAC PAIN

Lumbago, lumbosacral nerve pains, uterine displacements, coccyodynia or coccyalgia, hemorrhoids and bone disease or bone tumors are not now sufficient diagnoses to account for all the kinds of backache of the lower part of the spine. Orthopedists have long shown that backaches may come from weakness or broken arches of the feet, as already suggested, throwing the whole center of gravity so far off as to cause pain in the muscles of the back in the effort of these muscles to keep the body in proper equilibrium. Physicians, gynecologists and surgeons are now taught that many backaches are due to relaxation of the sacro-iliac joints, to inflammation in these joints, and sometimes to degeneration of the bones of these joints. This kind of backache occurs most frequently in women.

It was long believed that the sacro-iliac joint was not intended to have much motion. It has been learned, however, that it has a valuable and necessary function, and when disabled causes symptoms. joints may suffer from arthritis due to an infection. rheumatic or otherwise. They may be disturbed by faulty posture or position, as suggested before. They often become permanently injured, owing to a relaxation of the ligaments of the joint, often due to long continued lying in bed, whether from a long illness, such as typhoid, after surgical operations or from other illnesses which mean much or continued lying on the back. Consequently, any patient who must be long recumbent must be frequently turned, if possible, and the bed must be flat and must not be allowed to become sunken in the center. Many an otherwise well person has iliosacral and lumbosacral backaches simply because his bed is too soft and the springs have relaxed, and he lies all night as one would in a hammock. Backache of this type may be entirely cured by a stiffening of the springs, or a change of bed.

These joints may be strained by a suddent wist or turn, or by direct injury in this region. Lumboscaral backache frequently dates from an operation, when the patient was long in an obstettic or lithotomy position. Great care should always be exercised during these prolonged operations that the legs are occasionally moved and not allowed to hang in a position that is of great disadvantage to the illoscaral joint. Some orthopedists believe that these joints may be injured by lifting a heavy object; others are not so convinced. Lovett does not believe that a strain of this joint is thus caused, but considers it always an attudinal strain

due to faulty positions and fatigue. Patients with this kind of backache often hold themselves more or less rigid while walking, thus tiring other muscles. They dislike to jar themselves, and the pain may radiate down the glutteal muscles into the thighs, or there often seems to be an associated sciatic nerve pain. Often a patient with sciatica is not benefited until a defective sacro-iliac joint is improved.

A lumbago or pain in the lumbar muscles, that is, a myalgia of the lumbar muscles, will respond readily, as a rule, to a diet without meat or to a diet limited to milk and cereals, with plenty of water, and to massage and local heat. The addition of alkalis, such as potassium citrate, 2 Gm., in wintergreen water, given three or four times in twenty-four hours will hasten relief. If the pain is due to a weakening of the sacro-iliac ioint, none of these treatments will be curative.

The only treatment that is of any avail in sacroiliac relaxations or weakened joints is afforded by immobilization by strapping over the sacro-iliac region, unless the patient rests in bed on a stiff mattress. The straps of adhesive plaster may go all around the body at the level of the upper part of the ilium, and may cross each other over the sacrum; or they may be run diagonally from just below the brim of the pelvis around and across the back. Each stray should overlap the other from a third to half its width to cause good firm support. When diagonal straps are used, a irm supporting strap of adhesive should be put all the way around the pelvis.

If the straps are of benefit a proper kind of corset for a woman, or supporting belt for a man, may be made for permanent use.

# LUMBAGO

While most of these backaches of the lower part of the spine were long attributed to lumbago or myalgia of the lumbar muscles, we now know that only a small proportion of backaches in this region are due to this cause. Lovett, in a study of 83 cases of backache, found only I due to lumbago. As just suggested in discussing the diagnosis of lumbago from sacro-liac joint pain, the treatment there outlined for lumbago is almost invariably successful. Hot water applications are also of value, and especially hot sitz baths followed by deep massage. If the patient is rheumatic and has had joint pains, the salicylates may be given. Temporary strapping of the back up and down the spine, or in such a way as to relieve the affected muscles, always brings comfort, hastens recovery, and allows the individual to get about sooner than when strapping is not done. Electrical and vibratory treatments, and deep massage, are also of much value.

#### BACKACHE DUE TO PELVIC CONDITIONS

Women with disorders of the pelvic organs frequently complain of backache. It is often associated with painful meastration, and is undoubtedly due to the pelvis or to an obstruction to the passage of the blood at the cervix uteri. Retrofisplacement may produce backache in the sacral region, but the amount of displacement is no index to the amount of pain the patient will suffer. Backache can be absent in marked retroversion, but is likely to be present if there are many adhesions. Cervical erosions and lacerations, inflammation of the uterus and ovaries, and tumors of those organs may all be causes of lumbosacral, but principally sacral, backache.

No lumbosacral backache in a woman should be treated without a careful pelvic examination having been made. A correction of any malconditions found will be the only means of relieving such a backache. However, it should be remembered that a patient may have other causes of lumbosacral backache, even if a pelvic disturbance is present. Consequently, physical examination of the feet, legs and back should be made as though no pelvic disturbance were present.

#### BACKACHE DUE TO ABDOMINAL CONDITIONS

Pathologic conditions of the kidney may cause pain to be referred to the lumbar region. The most frequent kidney causes are calculi, pyonephrosis, perinequintic abscess, new growths and floating kidney. While many floating kidneys do not present any symptoms, sometimes a kidney that is only slightly loose may cause distinct symptoms and pain referred to the

back. Examinations of the urine, especially when obtained by catherization of the ureters, will reveal the presence or absence of pus, and generally of a calculus. Roentgenoscopy will almost always clear up the calculus question. If a calculus is present in the pelvis of the kidney causing backache generally, pain will also be referred down in the direction of the ureter to the bladder, and in the male to the testis. This proves immediately that the backache is secondary to the other condition. A constant study of all the urine passed for a few days, and observation of the temperature, will reveal pus, if present in the kidney. The treatment of these conditions is, of course, surgical.

A floating kidney causing pain may be kept in position by a proper abdominal belt. If it still creates pain

and symptoms, it should be fixed by operation.

A pendent or very obese abdomen may cause the patient so to change his normal posture as to produce backache. Abdominal supports will help in such a case. Ptosed abdominal organs may cause such dragging on ligaments as to produce backache; again, abdominal bandages and proper supporting corsets will relieve the strain on the back muscles, allowing the patient to assume a more normal posture while walking and standing.

Impacted feces in the colon, abdominal and rectal growths, and syphilis of the spine are all occasionally sources of backache, and, of course, treatment of the

back alone is futile.

# NEURASTHENIA-PSYCHASTHENIA-HYSTERIA

Neurasthenia, psychasthenia and hysteria may be considered as a single condition in which there may be a subsecretion of the suprarenals as suggested by Osborne (1. A. M. A., March 23, 1901, p. 796) resulting in physical fatigue with circulatory weakness and prostration; mental fatigue with sleeplessness, loss of appetite, and thus a marked insufficiency in the recuperative power of the body, or some special mental stress peculiar to the individual concerned. The average physician is inclined to group all functional nervous disorders into this general category. Persons who are always neurasthenic, always subnormal, without any special diseases, should be placed in this classification.

The typical neurotic person generally, if not always, has a disturbance of the thyroid gland. The typical neurasthenic patient probably generally has disturbance of the suprarenal gland on the side of insufficiency. The blood pressure in these neurasthenic patients is almost always low, and their circulation is poor. Often the activities of the internal organs are impaired, although there may not be any discoverable organic disease. Mental exertion, even the simplest, often causes so much weariness and exhaustion as to be prohibitive: such exertion must be forbidden. A vasomotor ataxia, often present, allows chilling, flushing, cold or burning hands and feet, drowsiness when the patient is up, wakefulness on lying down and hence insomnia. The nutrition may be fair or even good, and the weight may be normal. There may be some tingling or numbness of the extremities.

There is not much doubt but that the cause is disturbance of one or more internal secretions, but just which glands are at fault is difficult to determine. Testicular and ovarian disorders, especially on the side of deficiency, are known to cause general depression, hysteria, hypochondriasis, melancholia and disturbances of the digestive secretions. Irritation of the thyroid secretion may cause in one patient hysteria and in another patient depression; or both conditions may occur in the same patient at different periods. That very large mammary glands in women who are not pregnant and who are not lactating may disturb the system has not yet been proved. Many girls and women, however, who are not well and strong, whose flesh is flabby, who may either be overweight or underweight, and who have excessively large mammary glands, may be disturbed by an internal secretion of which we as yet know little. Pituitary disorder may affect the cerebral activity.

Many of the symptoms of physical and mental fatigue, with low blood pressure, especially if accompanied by increased pigmentation anywhere on the skin, may be due to insufficiency of the suprarenals.

Any sensible suggestion is worthy of trial in this troublesome neurasthenia, especially as such persons readily acquire the sanatorium habit and become more depressed. Physical and healthy mental exercise is

good for these patients. Generally an increased protein diet is of value, as many of them have been for one reason or another, reducing their meat, fish

and egg intake.

The Weir Mitchell system of prolonged rest is often successful, but Riggs (Bull, Johns Hopkins Hosp., October 1916, p. 281) maintained that in some of these cases prolonged rest has done more harm than good. Riggs believes that neurasthenia is primarily a mental disorder; that the difficulty, in nearly all cases, is originally independent of any and all bodily conditions, and that it exists in spite of a structurally normal central nervous system. To all intents and purposes, then, the neurasthenic is an originally normal individual. He is sound of mind and body, but this normal apparatus of his gets out of working order because it is unskilfully used, and, therefore, gets out of internal adjustment, and also out of adjustment with what should be its work. Were neurasthenia exhaustion, rest would cure it; it does not. Were it an inherent weakness of the organism. not a single case could be cured; many cases are cured. Were it due to physical disorders, then physical treat-ment of these difficulties would cure it. The conclusion seems clear that neurasthenia is not weakness or exhaustion; that it is not a malady of the intestines, the heart or the stomach, or a disorder dependent on structural change of the nervous system, and that it therefore cannot be cured by rest or by any other physical means. Riggs would rely primarily on psychotherapy and reeducation. Occupation plays a large part and the patient's work must interest and please him.

This whole discussion tends to prove that the trouble is with the endocrine glands. It should be urged that for the supposed suprarenal insufficiency it is not enough to give the blood pressure-raising substance of the suprarenals, but that the whole gland must be fed. Just how much valuable activity is absorbed from the suprarenals when fed has not been determined. Iodine in some form, in small doses, is often a most valuable

The great necessity in the treatment of patients with functional nervous disorders is individualization. The patient's physical condition must be thoroughly analyzed for evidence of sepsis, focal abscesses or intestinal intoxication: for indications of endocrine deficiency: for hypotension or hypertension; for anemia or plethora, or for any other chronic disturbance. In the same way his mental condition must be thoroughly studied by all the methods properly utilized by the trained physician. This should include an investigation of his heredity, environment and training, and possibly a rational analysis of his mental status and habits. Successful treatment must be based on such a minute study of etiology. The presence of physical disturbances is evidence of a chronic irritation factor and abnormal conditions should be corrected. In the same way mental therapy should be utilized in the form of conscious correction, suggestion and rational psychoanalysis. If the physician will make use of the extensive therapeutic armamentarium that is available to him for the treatment of such conditions he will obtain results far more permanent and successful than are accomplished by those who rely on suggestive methods alone.

# DISEASES OF THE SKIN

Prurius: Itching, 583.—Prurius, Ani, 589.—Pruritus Vulvue, 595.—Pediculosis, 597.—Scabies, 599.— Ringworm: Tinea Trichophytima, 691.—Impetigo Contagiosa, 611.—Psoriasis, 617.—Eczema, 621.— Bolis and Carbuncles, 628.—Alopecia: Baldness, 23.—Urticaria, 639.—Rometgen-Ray Dermatitis, 643.— Chapped Hands, 644.—Chibbian, 645.—Prosthe, 648.—Burns, 630.—Plant Poisoning, 656.—Chloasma, 658.

# PRURITUS: ITCHING

Pruritus, or itching, represents one of the most puzzling problems in medicine. The clinical manifestations are connected with the terminations of the sensory nerves in the epidermis. Many believe that it is associated with hyperemia and inflammation, this condition sometimes resulting in atrophy, with a continuance of itching. There are innumerable reasons for concluding that these pathologic conditions are not the ultimate cause of the itching in many cases. For example, Oxyuris vermicularis, or pinworm, causes pruritus in children without any local lesion or disturbance in the nutrition of the skin evident on inspection. Moreover, the pruritus is probably not due to the presence of a foreign body on the skin. It is also a question whether the itching produced by pediculi, or lice, results entirely from their presence on the skin in a quiescent state or even in active movement. The rapidity with which the itching in scabies subsides under sulphur treatment indicates that it depends on something besides the presence of a foreign body. Itching produced by the bite of a mosquito is out of all proportion to the local congestion and inflammation and is no doubt caused by some poison injected by the mosquito. The itching associated with jaundice dependent on obstruction to the flow of bile into the intestine is due to the irritation

of the ends of the sensory nerves by some substance absorbed from the bile into the blood. The itching in urticaria, due usually to the ingestion of some unusual article of food, is probably caused by some poison carried to the nerve endings in the blood as in the case of jaundice.

It will be noted that many diseases accompanied by congestion and inflammation of the skin cause itching. It is a curious fact, however, that syphilis, which is constantly accompanied by cutaneous lesions, has the striking characteristic that its skin lesions are usually

unaccompanied by itching.

With certain general diseases, especially diabetes and gout, pruritus is a common symptom. These disorders are all characterized by the presence in the blood of

chemical bodies which are ordinarily not there.

Pruritus may be of central origin, and occurs frequently in hypochondriasis and hysteria. Still another form is described as having a psychic source, and is seen in insane persons who have hallucinations of the presence of parasites, such as pediculi, on the skin; those hallucinations are often difficult to eliminate, and sometimes are removed only after repeated applications of antipruritic remedies.

Focal infections and the absorption of bacterial poisons into the blood are frequent causes of pruritus.

localized or more general.

In intractable cases of general pruritus, causes should be looked for in the patient's general health. Among these are urticaria without wheals, which may be due to any of the innumerable causes of urticaria. These one will find considered in any textbook on dermatology. Hodgkin's disease, leukemia or pseudo-leukemia is a rare cause, but intractable cases of pruritus should be studied for this possibility. Cases in which bile or sugar is present in the blood also may represent what is called idiopathic pruritus, that is, a pruritus for which no cause can be discovered. Senile pruritus is the most familiar of these, although it probably represents sensitiveness to external irritants produced by atrophy of the skin. Of course, all local causes of itching should also be investigated, but in intractable chronic general pruritus they would hardly be the source of the trouble.

### MANAGEMENT

In undertaking the treatment of a case of pruritus it is necessary to examine every organ of the body so as to restore it to normal action, if possible. First, the condition of the digestive organs must be carefully investigated, and the diet must be properly regulated. There are two types of persons in whom pruritus is seen: one is the stout, robust, plethoric person who is continually overeating, and the other is the thin, hungry person who is continually starving himself. In the case of the former the diet should be cut down. The protein substances should be greatly reduced, and the starches and sugars should be considerably limited. It will be found that certain articles of food are not completely digested but give rise to fermentation. Such articles should be reduced to an amount that can be taken care of by the digestive organs. Fatty articles of food shall be advised for thin patients of the second group and a sufficient amount of protein should be given to afford adequate nourishment. In both classes, fruits, especially oranges, will be found exceedingly beneficial.

If the patient is constipated, measures should be taken to make the bowels act regularly and abundantly. A small dose of calomel, several times repeated, is sometimes useful for this purpose. If calomel is thought to be undesirable, a saline, as 1 or 2 drachms (4 or 7.8 Gm.) of magnesium sulphate or sodium sulphate, may be given in half a glassful of water in

the morning before breakfast.

## ELIMINATION

Pruritus is frequently associated with deficient elimination. If the condition of the urnic indicates such defective elimination, the internal use of lakalis will generally be found of advantage. In the case of the plethoric individual with a strongly acid urine of high specific gravity, the following prescription may be used:

B Potassii citratis ....... 40 3 ix Aquae menthae piperitae.. 200 or fl3 vi M. Sig.: Two teaspoonfuls, in water, three times a day, after meals.

Gm. or Cc.

If this dose, three times a day, does not alkalinize the urine (if that is the object desired), it may be adminis-

tered four times a day.

Although it is admitted that pruritus is associated with the sensory nerves, and it is asserted that in some instances it is due to a disturbance of the central nervous system, no drug acting on the brain, spinal cord or nerve trunks is effective in pruritus, with the possible exception of the bromides. The continuous treatment of pruritus with bromide is inadvisable. Temporarily such treatment may be used.

#### LOCAL APPLICATIONS

Generally, in order to stop the itching, it is necessary to apply some drug to the skin, which will lessen the sensibility of the ends of the nerves which are in trouble. Several drugs are used for this purpose. The most useful are phenol (carbolic acid), menthol, camphor, chloral hydrate, thymol, oil of cade, alcohol and the alkalis. The following are a few prescriptions which are suggestive. Various modifications of any one of them may act satisfactorily.

Gm. or Cc.

Liquoris potassae	fl3 iss fl3 ii
Or, Gm. or Cc.	
Phenolis	fi3 iii fi3 iii fi3 i fi3 iv
M. Sig.: Sponge over irritated surfaces. Shake.	
Or:	
B. Phenolis	m xv
Calaminae	3 v 3 iiss 5 vi

M. Sig.: Sponge over affected area.

TREATMENT	
Or:	
Gm. or Cc.  B Mentholis	gr. vii 5 ss fl3 vi fl5 viii
Or:	
Gm. or Ce.  B Mentholis 50 Camphorae 150 or Olei amygdalae dulcis 2 Adipis lanae hydrosi 25 M. Sig.: Use externally.	gr. x gr. xviii M xxxv 3 i
Or:	
B. Camphorae	3 ss
Or:	
Gm. or Cc.	gr. xv gr. xxv fl3 iii
Or:	
Signature   Sign	gr. lxxv 5 ss 5 i
Or:	
B. Olei cadini	n3 iss 3 ii
Gm. or Cc.	
Adipis or	fl3 iss
Adipis lanae hydrosiāā 25  M. Sig.: Use externally.	5 i

As a lotion the following antipruritic mixture will be found extremely soothing:

	Gm	or C
$\mathbf{R}$	Zinci oxidi	101
	Talci purificati	10
	Sodii boratis	10
	Mentholis	2 80
	Glycerini	10
	Aquae calcisq. s. ad 2	00

M. Sig.: External use. Shake.

Or:

	ti d	m. or	LC.	
Ŗ	Tincturae iodi	5	or	fl3 iss
	Glyceriniq. s. ad	25		fl3 i
M.	Sig.: Paint on externally.			

These prescriptions may be used when only a small part itches, as in chilblain.

Various alcohol and menthol sprays and washes, or simple saline sprays are often satisfactory. The following is a menthol spray:

The question of the use of alcohol and tobacco is usually raised in connection with the treatment of pruritus, although generally both are forbidden. The vast proportion of people who use tobacco and alcohol are not affected with pruritus. However, this does not indicate that alcohol and tobacco may not be detrimental to sufferers from pruritus, and possibly in some instances their use may aggravate the condition. In such cases their discontinuance should certainly be advised; but in most instances their use or disuse will probably be a matter of indifference.

Winter itch is an annoying form of cutaneous hyperesthesia that occurs in an adult with an abnormally dry skin and comes on with the advent of cold weather. Treatment is purely palliative. Any nonirritating ointment should be used to keep the skin well greased. Equal parts of hydrous wool fat, petrolatum and benzoinated lard are recommended. Woolen underwear should be avoided and alkaline baths taken occasionally. Change of residence during the winter months is the most effective remedy. The condition is described in all textbooks on dermatology.

Bath pruritus is not an uncommon disorder. It is apparently a neurovascular disturbance of the cutaneous vessels. Treatment is usually of little or no avail. In some instances the patient can avoid the discomfort by taking a moderately warm bath and remaining in the bath room, undressed, for the following half hour.

In extreme cases the competent dermatologist may advise and apply the roentgen ray, radium or high frequency current.

Å'. C. Ernstene and B. M. Banks (J. A. M. A., Feb. 4, 1933, p. 328) gave histamine subcutaneously, usually in doses of 0.5 mg, twice daily to 6 patients with pruritus associated with urticaria and to 7 patients with pruritus due to other conditions. Three of the 6 patients with pruritus and urticaria were promptly benefited by the treatment. In 1 of these lasting and complete relief from the itching was obtained. In the other 2, complete or practically complete relief was followed by a relapse of pruritus. Four of the 7 patients with pruritus due to causes other than urticaria were relieved by the histamine.

### PRURITUS ANI

The term pruritus ani is broadly used to include such conditions about the anus as are accompanied by itching but do not show any manifest lesion, and also those conditions in which there are decided pathologic changes in the skin and in which intense itching is the most important symptom. Pruritus ani commands the attention and interest of the general practitioner, the proctologist, the dermatologist, and, at times, the neurologist.

#### RTIOLOGY

The physician does not do his full duty to his patient if he prescribes for itching about the anus without making a careful examination of that region and interrogating the patient in regard to his habits and the manner in which the functions of the different organs are performed. It is, ordinarily, a simple matter to determine whether the itching is due to the presence of the Oxvuris vermicularis (pinworm) or to the presence of pediculi. The occasional discovery of these parasites in this region and their causative relation to the production of itching should not be overlooked. On local examinations, it is frequently possible to detect the presence of a fissure of the anus, or an ulcer in that situation, or within the sphincter ani muscle. In other cases there may be found a fistula, hemorrhoids, or polypi; and further exploration of the rectum may show a catarrhal condition of the mucous membrane. or a disease of the crypts.

At the beginning of the condition it may be impossible to find any lesion, but, as the case progresses unrelieved, the energetic scratching in order to relieve the itching usually produces a thickening of the skin. Inflammation of the skin occurs, causing an increase of the connective tissue which presses on the nerve endings. This may be followed by an atrophic condition of the superficial layer of the skin. The thickened integument may have a whitish, sodden appearance, and may lie in folds, on or between which there may

be fissures caused by the scratching.

In many cases there occurs a condition of moisture of the skin about the anus. Some believe that this moisture is the cause of the itching, but it is more probable that in most instances it is an accompaniment of the condition that gives rise to the itching, or may be associated with the lesion of the skin which is produced or aggravated by scratching. This moisture is probably due to a hypersecretion of the sebaceous glands. but it is possible that a part of it comes also from the sweat glands.

In some cases it will be found that a disturbance remote from the local manifestation gives rise to the itching. Congestion of the mucous membrane of the intestine accompanied by a catarrhal condition; chronic appendicitis, or congestion of the liver may be accompanied by a congestion about the anus that gives rise to intolerable itching. Pressure on the veins, as from the enlarged uterus during pregnancy, or from pelvic or abdominal tumors, may produce similar effects.

Some general diseases are occasionally accompanied by pruritus ani. The most important of these is diabetes, but the condition may be present in chronic nephritis, in gout, and in rheumatism. It is also a frequent accompaniment of the degenerative changes associated with old age. Some cases show a decided neurotic element. Sometimes business or professional men who are actively engaged in following their vocations and who are subject to unusual nervous and mental strain are the subjects of this disorder. These various conditions, which do not cover all the causes that have been enumerated as etiologic factors of this itching. indicate that there is a wide scope for the use of judgment in selecting a line of treatment appropriate for each individual case. When this condition is an incident of senility, or of such general diseases as diabetes or nephritis, the treatment is generally palliative, by means of local applications. Of course, any improvement in the diabetes, or in the nephritis, will cause improvement in the local trouble.

## MANAGEMENT

The dietetic management of the case and the employment of such fremedies as promote exerction of the products of metabolism are clearly indicated. In a large number of patients it will be found that a rearrangement of the diet is of great importance. Many of these patients eat too much, and their diet should be restricted so that they eat less and limit the amount of food to the needs of the system.

In many instances there is constipation, accompanied, sometimes, by intestinal fermentation. If this constipation cannot be corrected by a regulation of the diet, some laxative may be necessary. Aloes often seems to do harm by increasing the irritability and congestion about the rectum. Usually cascara or a saline cathartic is preferable. Sometimes it is well to give a moderate dose of cascara at night and follow this by a saline laxative in the morning, regulating the dose so that the patient may have one soft movement after breakfast.

If the urine is highly colored, of high specific gravity, or is strongly acid, the administration of alkalis such as potassium citrate is useful.

Sometimes an operation, perhaps slight or even of considerable gravity, is indicated. Tags of hypertrophied skin should be snipped off, and hemorrhoids should be removed. If there is a fissure or ulcer, it must be treated by local application of solution of silver mitrate, daily if the solution is weak (1 to 3 per cent), or once in four or five days if the solution is strong (10 per cent). If there is a fistula, it should be incised or excised. If there is catarrh of the rectum, it may be treated by alkaline enemas.

A considerable number of these patients have been treated with satisfactory results with the roentgen ray. These applications may be given at first with two exposures a week, until some dermatitis is produced, and then once a week. The roentgen ray causes a diminution of the excessive moisture which is sometimes present, and a decrease in the size of the sebaceous foliclies, which seem to be affected by the ray more than the sweat glands. Others have used the high frequency current with asserted advantage.

#### LOCAL REMEDIES

Numerous local remedies are used with varying degrees of success. A group of suggestive prescrip-

tions has already been given.

Before the application of any remedy is considered, a most scrupulous cleanliness should be exercised. After every movement of the bowels, the anal region should be bathed with hot water, which may be used without medication, or there may be dissolved in it simple salt, sodium borate, or sodium bicarbonate. The use of newspaper or other coarse paper should be strictly prohibited.

At such times as the itching comes on intensely, especially in the evening or after retiring, local applications of either ice-cold or very hot water often afford considerable relief. The hot water may be medicated by the addition of boric acid to the point of saturation, or with sodium borate. Phenol (carbolic acid) may be applied in a solution of from 2 to 3 per cent strength, and it may be used in much stronger solution once or twice a week.

The patient should not use any dry, detergent paper. The part should be dried without rubbing, and then zinc stearate powder applied if the skin is moist. If dry, a soothing ointment such as zinc oxide should be

used. If these do not relieve, two or three applications of a saturated solution of potassium permanganate might be tried at intervals of one week; the part should be dried and a mild salicylic acid unguent applied. The patient must not rub or scratch. There is no specific for this trouble.

Pusey and Sutton both recommend highly the use of the roentgen ray in intractable cases of pruritus ani, vulvae or scroti. It is administered in moderate dosage

at daily or triweekly intervals.

### SUMMARY

The etiology of pruritus ani is complex. Among the causes are:

The irritation of even the slight amount of fecal matter not removed by dry toilet paper.

2. Ringworm or yeast infections.

Bacterial infections, such as those by the colon bacillus or Streptococcus faecalis.
 Animal parasites, pinworms or other intestinal

worms or amebas.

5. Local ailments, fissures, hemorrhoids, fistulas, skin

tags, polypi or spasm of the anal sphincter.

Intestinal disease, cryptitis, proctitis, colitis.

- 7. Intestinal stasis, causing fermentation, absorption of toxins and irritation of the anus by hard feces.
- Liver disease, cholecystitis, cirrhosis, carcinoma.
   Genito-urinary disease, nephritis, cystitis, prosta-
- titis, urethritis, vesiculitis, endometritis.

  10. Anemia, diabetes, exophthalmic goiter, the meno-

pause, pregnancy.

11. Neuroses.

12. The results of scratching, eczema, lichen simplex chronicus.

The treatment should be directed to correction of the cause, if that can be determined. In many cases, careful cleansing after each stool with a soft cloth or soft tollet paper, wet with water or boric acid solution, will stop the itching. If this is not entirely successful, an antipruritic ointment, such as compound resorcin ointment, can be applied after cleansing and whenever a

paroxysm of itching occurs. On no account should the patient yield to the temptation to scratch. Rough or tight clothing should not be worn and the patient should not sit too long at a time. The generous use of talcum powder after the cleansing helps to counteract the tendency to maceration.

ency to maceration.

Ringworm or yeast infection can be determined by collecting scales or macerated epithelium, treating it for a time with 10 per cent potassium hydroxide solution, and examining with the high dry lens, or by culture on sugar mediums, with incubation at room temperature for a week. If such infection is found, a weak Whitfield ointment can be used, I per cent salicylic acid and 2 per cent benzoic acid in oinfment of rose water, or, if the parts are much macerated, paining them once or twice daily with 1 per cent solution of notassium nermanganate.

potassium permanganate.

In all cases, hot foods and condiments, rich foods
and sweets should be avoided, and care should be taken
that neither constipation nor a fluid bowel movement
occurs. Fissures can be painted with silver nitrate solution, from 2 to 20 per cent, once in several days. The
parts may be painted once a day with compound tinc-

ture of benzoin or the following:

	Gm. or Cc.
Tannic acid	1.3
Alcohol	
Glycerin	ăă 15.0

Heat may be applied as douches, sitz baths, hot compresses or hot air douches.

Autogenous vaccines are held in esteem by some authorities. Alkali bromides by mouth may be necessary for some patients, and some may need more expert psychotherapy than can be furnished by the general practitioner. Injections of the patient's own blood, from 5 to 20 cc., given intramuscularly once every five days, may be helpful.

When the cause cannot be removed and milder methods fail, radiotherapy can be resorted to with fair assurance of relief. One-fourth crythema dose of unfiltered or mildly filtered roentgen rays are given once a week until the itching ceases, or until eight such doses have been given. It is not advisable to exceed this dosage. Care must be taken that the adjacent surfaces of the buttocks do not receive too great a dose.

Surgical methods have long been in use; but the old method of dissecting away the skin about the anus in order to cut the nerves is out of favor, for the nerves regrow and the itching returns in a large percentage of cases. The injection of 95 per cent alcohol under general anesthesia, 0.1 or 0.2 cc. in each place, just under the skin, the injections about one-fourth inch apart over the whole area, is more successful, sometimes affording relief for years.

#### PRURITUS VULVAE

All of the general remarks pertaining to pruritus ani and perineal pruritus are equally applicable to pruritus vulvae

An attack of vulvar pruritus accompanying some genital disturbance is liable to return later, even without any local factor to invite it. Drugs known to have brought on vulvar pruritus in local applications are phenyl salicylate, phenol and mercuric chloride. Too hot and too often repeated water douches, or the use of perfumed soaps or toilet waters have also been responsible for this disturbance. Still another and quite frequent cause is the oxyuris. With this there is usually associated anal pruritus. The eggs of the oxyuris may be deposited on the mucosa or skin and cause pruritus. The lesions resemble those of a secondarily infected eczema, and only a microscopic examination will reveal the helminth's ova. Thrush has also been observed as a cause of this condition in young infants and debilitated elderly women, and in a few pregnant women. A polyp in the urethra, urethritis, calculi in the bladder, herpes, zona, inflammatory processes in the vulva, vagina or uterus or fibromas are also liable to induce pruritus, as are likewise diabetes and other constitutional diseases.

Among other numerous causes for pruritus vulvae are many which are fairly obvious, such as leukorrhea, thrush, Trichomonas vaginalis vaginitis, kraurosis, leukoplakia, pediculosis and such systemic conditions as diabetes, syphilis and morphinism. However, in many cases no source can be found and the condition is usually designated as neurotic

A careful search should be made for a possible cause and, if one is found, treatment should be directed toward it. If no source can be discovered, the patient's general condition should be built up. An attempt should also be made to obtain a careful personal history with a view to detecting a psychic cause or one based on a disturbance in the sex relationship. If the cause seems to be local but no specific one is ascertainable. applications of silver nitrate, calamine lotion, zinc oxide or sodium bicarbonate may be tried. Mild cleansing douches are helpful. In stubborn cases, procaine hydrochloride injected under the pruritic area and around the near-by nerves may be of benefit. Mild roentgen treatments have helped some women and, in exceptionally obstinate cases, excision of the vulva has been resorted to with success.

The vulvar pruritus in pregnancy usually disappears after delivery. The women subject to this condition at the menopause may be of the gouty temperament or there may be local changes in the vagina setting up the pruritus or nervous disturbances. After exclusion of all other causes, there is left a group of patients with essential pruritus. This is distinguished by its intensity and tenacity. Tentative organotherapy such as thyroid treatment is justified here. Vulvar pruritus thus requires general treatment to relieve constitutional disease, to reduce toxemia and to reenforce the resisting powers in all ways. The inherited predisposition, the environment, the food, the general hygiene, and traumatism should be investigated as possible causes. Among the measures that may be required are change of scene. and abstention from coffee, tea, chocolate, sausages, veal, fish and shellfish, cheese, tomatoes, spices, strawberries, gooseberries, cabbage and cauliflower. Hygiene of the digestive tract ranks first in all treatment of pruritus. The teeth should be kept in order; an infected tooth may perpetuate a pruritus started by some other cause.

Dr. William A. Pusey declares that nothing definite is known about the pruritus of pregnancy, pruritus gestationis. One author thinks that it starts with the stretching of the skin of the abdomen, and that generalized pruritus not infrequently results from the localized form. Generalized pruritus may be due also to emotional disturbances, functional or organic nervous disease, toxic disorders, especially diabetes and renal insufficiencies, or ingestion of drugs such as the opiates. It tends to recur with each pregnancy in the later months and to subside after delivery. Cases have occurred which were so severe as to require emptying of the uterus. It is presumed of course that there will be a careful lookout for the development of toxemia. The blood sugar content should be determined, and the patient, unless conditions indicate otherwise, should be given a bland diet, one without condiments or spices, and with reduced protein. Locally, any suitable antipruritic solution may be used. An effective preparation is made by placing in a wide mouth gallon bottle 8 ounces of liquid petrolatum, 15 drops of oil of bergamot and 15 drops of oil of lavender. The inside of the bottle and of the cork are coated with this by rolling the bottle round until the liquid petrolatum has come in contact with the entire inner surface. Then 1 ounce of powdered tragacanth and 2 drachms of sodium benzoate are added. The mixture is shaken thoroughly and 16 ounces of water is added at a time until the quantities make half a gallon. After each addition of water the mixture should be shaken thoroughly. This is a smooth oily emulsion, suggested by Pusey, and is an agreeable application.

A good emulsion can also be made by taking 5 ounces of olive oil and lime water to make a pint. This combination produces a certain amount of calcium soap, which is not irritating and which serves to emulsify the solution. To either of these liniments, antipruritie substances may be added, such as from 5 to 10 drops of camphor phenol and camphor chloral to the pint. These antipruritie applications should be used limitedly to prevent their causing dermatitis. They are to be apolied as frequently as indicated by attacks of itching.

# PEDICULOSIS

This troublesome condition has long been treated by applications of kerosene oil. The kerosene is applied, and the hair is covered with a suitable cap for twenty-four hours. It is then thoroughly washed, and the nits are subsequently removed with a fine comb.

A more recent method of eradicating lice, first recommended by Sabouraud, is the use of xylene. Xylene (xylol or dimethylbenzine) is a colorless liquid coal tar product. It has a penetrating but not unpleasant odor, and mixes with alcohol and ether, but not with water. It is a strong parasiticide, will rapidly destroy lice, and will penetrate their ova and destroy them. When undiluted, it causes a sharp, burning sensation when applied to the skin; but the pain which it thus excites does not last long. Xylene does not seem to blister or cause dermatitis. It evaporates when exposed to the air or when applied to the surface of the body, and is highly inflammable. Consequently it should not be used near a fire, or in the evening if the artificial light is other than electric.

Although xylene may be used in certain places in certain instances in full strength, it is better to apply it in combination. A mixture of equal parts of xylene, alcohol and ether is recommended by Faniel as safe and efficient.

For the removal of lice from the head, cotton is scaked in this mixture; the scalp is thoroughly washed with this cotton sponge, and all the strands of the hair are drawn through the sponge. Generally with one application, and certainly with two applications of this treatment, all the parasites and nits are destroyed. The disease may be cured in half an hour, even when the hair is long, as in women and girls.

If scratching has caused eczema and scabs on the scalp, these may be softened by the application of petrolatum. The scabs may be removed later. On these excoriated places the mixture of xylene mentioned is too strong, and Lane (New York M. J., Oct. 16, 1915, p. 804) recommends in these instances the

OH	ing:	Gm. or Cc.
B	Cylene	4
	Petrolatum	30
N.F	a · Hee externally as directed	

The day after this ointment is applied to the scalp it may be washed off, and the strands of the hair treated with the mixture of xylene, alcohol and ether. It may be well to apply this ointment once more. As a final treatment of the pediculosis capitis, a fine-tooth comb may be run through the hair and the nits thus

removed for cosmetic reasons, although the ova have been killed.

In pediculosis of the pubis or axillae the same mixture of xylene, alcohol and ether should be used, and by
the same method. It is well, however, to precede the
treatment by a warm, cleansing bath, and to follow the
treatment by another bath. On the scrotum and vulva
and in the deep axillae the xylene mixture is rather
painful for a short time, and should be applied gently
and with care. The burning will last only a few hours.
If there are excoriated places on the skin in these
regions, the ointment recommended by Lane should be
used in place of the xylene solution.

#### SCABIES

If the burrows and the itch mite are found, of course the diagnosis of scabies is readily made, but there are many cases of itch in which the burrows are difficult of discovery, and the itch mite is elusive and evades the dermal scrapings for microscopic examination. Even the itching varies with different individuals, some few being very tolerant of the irritation and thus becoming conveyors and transmitters of the disease without their personal knowledge.

Various types of skin irritation develop during the several stages of scabitic inflammation. There may be papules, vesicles, pustules and crusts. The severest itching is generally present at night, and especially on

first retiring.

"The burrow or run is made by the female in the lower layers of the cornified epithelium of the skin." These burrows, or "roughened, curved furrows," occur most frequently on the anterior surfaces of the wrists and between the fingers. Sometimes these burrows are simulated by dirt-filled lines in the epidermis. The diagnosis can generally then be made by shaving off the suspected epidermis with a scalpel, laying the epithelia slice on a slide, adding a drop of glycerin, placing a cover glass over it and examining with a low power lens. If the eggs of the itch mite, or the mite itself, are found, the diagnosis is established.

When the fingers and hands do not show symptoms of this infection, signs may be discovered on the elbow tips, and on the nipples of women. When there is a

generalization of the disease, characteristic signs and eruptions will be seen on the hands, wrists, axillary folds, abdomen and nates, in the popliteal spaces, and

on the genitals.

It should not be forgotten that the itch may be present in a mixed infection; in other words, there is more or less eczema from the irritations and scratchings and there may be nodular and suppurative processes, enlarged glands and syphilitic eruptions.

The disease does not seem to be acquired in ordinary social life, but is passed from individual to individual.

or contracted by sleeping in an infested bed.

#### TREATMENT

The parasiticides most used in eradicating the itch are sulphur, betanaphthol, balsam of Peru and cresol.

The patient should be instructed to take a hot bath, using plenty of soap and thoroughly cleansing, perhaps with a soft nail brush, the parts where the parasites are mostly located. He should then anoint all parts of his body with the sulphur ointment, and should especially rub it into the parts most affected.

In mild cases of this disease thorough bathing and cleansing of the affected parts with strong alkaline soap is recommended. Rubbing and dusting the rest of the body with washed sulphur and then dusting the sheets of the bed with this dry sulphur should accompany this treatment. It may cause an eradication of the disease without necessitating the use of ointments with their discomfort and mastiness.

In more severe cases, sulphur is commonly employed as an ointment, I to 2 drachms (4 to 7.8 Gm) to the ounce, thoroughly rubbed in over the affected parts, the head alone being excepted. The ointmeted applied thoroughly at night, the patient then domining supplied woolen underwear which is not changed for from three to five nights, the duration of the treatment. Each night a new supply of ointment is rubbed in. At the end of the course the patient may bathe; but a bath need not be taken between treatments.

#### SULPHUR

The official sulphur ointment contains 15 per cent of sulphur, and is stronger than should generally be used, on account of the irritation and actual dermatitis that it may cause. One of the following ointments may be preferable:

			m. or	UC.	
$\mathbf{R}$	Sulphuris	loti	10]	or	3 is:
	Adipis ber	zoinatiq. s. ad	100		3 iii
M.	Sig.: Use e	xternally, as dire	ected.		

## Or:

		m. or	Cc.	
Ŗ	Unguenti sulphuris	50	or	3 iss
M	Sig . He externally as direct	had		

### Or in severe case:

	Gm. or	Cc.	
Ŗ	Betanaphthol	or	gr. x 3 s:
M.	Sig.: Use externally, as directed,		01

# Or for use especially in children:

		m, or	Cc.	
Ŗ	Sulphuris sublimatis	- 1		
	Balsami peruvianiãã	2	or	3 s
	Adipis	30		3 i

## M. Sig.: Use externally, as directed

# RINGWORM: TINEA TRICHOPHYTINA

To two very different diseases the name "tinea" has been given: one is tinea favosa, which is caused by the Achorion scholleinii; the other is tinea trichophytina, which is caused by the vegetable parasitic fungus trichophyton. It is the latter to which the present remarks will be limited.

### RINGWORM OF THE BODY

The effects of this fungus are usually subdivided three ways, according to the particular part of the body affected. When that part of the face on which the beard grows is affected, it is distinguished as tinea barbae, ringworm of the beard, or barber's itch. When the hair of the scalp is involved, it is known as tinea tonsurans, or ringworm of the scalp. When other parts of the body are affected it is designated as tinea circinata, or ringworm of the body. These three varieties

of the disease are also distinguished respectively as time trichophytina barbae, timea trichophytina capitis, and timea trichophytina corporis. The same remedies are applicable to the treatment of these three forms of the disease, but the location in which the lesion is found necessitates some difference in their mode of application.

The trichophyton fungus is found and grows in the epidermal layer of the skin. It penetrates into hair follicles, and also into the root and body of the hair. Its presence in the latter locations renders the application of drugs for its destruction difficult. It is on this account that the involvement of the hairy scale and the

beard is especially resistant to treatment.

There are several drugs which are beneficial in the treatment of the disease when they can be effectively applied. The most important are mercury, iodine, resortion and chrystorbin. When there are a few spots on the surface of the body, a useful application is the followine:

B Hydrargyri chloridi corrosivi 10 gr Glycerini 5 or Aquae 0.s.ad 50 ff

M. Sig.: Shake, and rub thoroughly into the lesion, twice a

The application of this lotion, or in fact of any remedy, should be preceded by a thorough scrubbing of the affected parts with hot water and soap, preferably soft or green soap. When the patient is a young child, care should be exercised not to use too strong a lotion and not to apply it to too extensive a portion of the body. Too liberal applications of strong mercurial lotions may cause mercurial poisoning.

If one prefers to use an oistment—and ointments are often exceedingly beneficial because watery preparations do not easily penetrate the skim—an efficient preparation is the official ointment of ammoniated mercury. It is 10 per cent in strength, and if there are many spots of disease, or the skin is tender, it is well to dilute the mixture with an equal part of lard or petroleum fat, as:

If the condition is chronic, and these washes and lotions do not prove effective, the patches may be painted with inticuture of iodine. This may be repeated every day for several days until the inflammation becomes so great that the application causes objectionable discomfort.

Ointments containing chrysarobin or pyrogallol are effective but should not often be used because they stain the skin and clothing, and sometimes cause con-

siderable inflammation.

In a series of cases successfully cared for by Ormsby and Mitchell, the treatment consisted of three preparations. In the severe cases of pyodermic or eczematoid dermatitis, a preliminary soothing treatment of naftalan combined with zinc oxide and starch was used. This was followed by 5 per cent chrysarobin in traumaticin (chloroform solution of gutta percha) which was painted on until a good reaction occurred. Ordinarily, the chrysarobin in traumaticin was immediately prescribed and direction given for five daily applications. The patient was asked to return for observations after eight days. If necessary, the treatment was repeated. In another series of cases, an ointment recommended by Whitfield was used. This contains 2 parts of salicylic acid and 4 parts of benzoic acid in 30 parts of ointment base. It is applied daily and can be used for several weeks without producing irritation.

Chrysarobin was used alone in 36 patients, who made an average number of 36 visits. The ointneam recommended by Whitfield was used alone in 8 patients, who made an average number of 2 visits. The number of cases in which this ointment was used is ovbiously much too small for comparison, but it appears to be somewhat more efficient than chrysarobin. Pusey advises the application of iodine, 2 per cent, in tincture of benzoin, and Sequeira prefers a mixture of 1 drachm (4 Gm.) of resorcin to 1 ounce (30 c.) of the com-

pound tincture of benzoin.

The roentgen ray has been used as a germicidal application, and as a promotor of a mild dermatitis (often a forerunner of a cure) in all parts of the body, and with frequent reports of success. The hair, when the ray is used on hairy parts, falls out, but may return

again. Such treatments are best administered by an

experienced roentgenologist.

Foley (Lancet, Jan. 24, 1914, p. 242) describes the following method which he believes is extremely effective: The diseased area is first washed with a strong solution of sodium bicarbonate and swabbed with spirit of ether to remove grease. It is then painted with tincture of iodine and sprayed immediately with ethyl chloride until the integument gets china white. The deeper the disease process, the longer the spray must be applied. In ringworm of the scalp three or four applications may be necessary, but on smooth surfaces one application usually suffices.

Hartzell has also found the ointment suggested by Whitfield, which contains 3 per cent of salicylic acid with 5 per cent of benzoic acid, most effective. He insists, however, that it cannot be used, as Whitfield has pointed out, without some degree of caution in markedly inflammiatory cases, as it occasionally produces considerable irritation. The formula for this ointment is:

		m. or Cc.	
	acid	2	gr. xxx
	acid	1 5	gr. xxiv
Linseed Hydrous	oilwool fat	1 5 15 15	āā 3 ss

These cases are often very obstinate, and treatment must sometimes be carried on intermittently for weeks. It frequently happens that an apparent cure results while a few of the fungi still remain in the skin without showing any evidence of their presence. Consequently, cases should be kept under observation for some time after cure is apparently complete, and if any evidence of a return of the disease appears, the treatment should be renewed.

This condition appears more frequently in children than in adults, and the growth of the fungus seems to be favored by high temperature and by moisture. The disease is contagious, and is readily passed from one person to another. Where considerable numbers of people associate intimately together great care should be observed to prevent the spread of this disease as well as of other diseases. The use of combs, brushes, towels and clothing by several persons should be strictly

forbidden. Especially should this precaution be observed when the existence is known of a single case among a number of children, as for instance in a large family or in a school. It seems likely that with the extension of medical inspection to children in the public schools and with sanitary barber shops, this disease will, in a few years, become exceedingly rare.

#### RINGWORM OF THE SCALP AND BEARD

Ringworm of the scalp or bearded portions of the body is ordinarily a stubborn condition to treat. There are two chief methods used in the treatment—the drug

therapy and the roentgen ray.

The roentgen ray treatment is of material aid in shortening the course of the disease. It produces epilation; it does not seem to kill the fungi but it may stimulate the skin to a healthy inflammatory process that aids in ridding it of the organisms. Such therapy should not, however, be undertaken by those not thoroughly conversant with the action of roentgen rays, as the harm done by incautious applications may be irremediable.

Thallium acetate has been employed for epilation but its use is attended with danger.

Some benefit has also been reported with the administration of thymol and oil of cinnamon,

The local use of remedies rarely effects a cure of this stubborn condition. The solutions suggested are usually strong antiseptics. The same preparations recommended for ringworm of the body may be utilized. The hair should be cut very short, thoroughly scrubbed and the mixture applied vigorously. Severe cases are

best treated by a specialist.

Tincture of iodine should be the best remedy, for it ranks high as a fungicide and penetrates the skin better than any other drug in this class; but this argument carries little weight, for the chief benefit from these drugs seems to be the inflammatory reaction caused by them, which results in immunity to the organism. The antiseptic action of the drug is useful chiefly in preventing the spread of the infection to others, and the depth of penetration is of value chiefly because of increased irritation. For this reason it is a fact, though it seems paradoxical, that deep ringworm infections

like kerion of the scalp or beard are more easily cured than the common superficial microsporon infection of the scalp in children, which remains comparatively noninflammatory.

Some cases of ringworm of the scalp, particularly those in infants or very young children, can be cured according to Stillians by the persistent use of mild remedies, such as ointment of ammoniated mercury, from 5 to 10 per cent, applied once or twice a day for several weeks. In older childdren, sodium thiosulohate solution, 14 per cent in water, can be rubbed vigorously into the affected areas twice a day until irritation results, when soothing applications, such as 10 per cent boric petrolatum, are to be applied until the irritation subsides, and then the same treatment repeated. If a stronger method is desired, the same thiosulphate solution may be followed by a 3 per cent watery solution of tartaric acid, releasing pascent sulphur and sulphurous acid. Strong measures are to be restricted to small areas of the scalp and not used for children less than 7 years old. Tincture of iodine may be painted repeatedly on an area an inch or less in diameter until a black crust forms. This should be torn off, to carry with it many diseased hairs. A soothing preparation is then to be applied until irritation subsides. more reaction can be obtained by alternating fincture of iodine and ointment of ammoniated mercury, causing an active dermatitis. Many other drugs and methods of this kind were in use before the epilating power of roentgen rays was discovered.

Croton oil is the most severe chemical used for this purpose. It should not be used for young children, and if used should not be applied to an area more than half an inch in diameter. It may be introduced into the hair follicles with a hypodermic needle in the smallest possible amount. Within twenty-four hours pustulation results and the hairs can be removed. Soothing ointment should then be applied. This treatment causes follicular scarring and the hair does not grow again. It should therefore be used only when

the bald spot can be concealed.

A milder method of using croton oil is its application in 10 per cent strength in olive oil, rubbing it into a small area and waiting for an inflammatory reaction. This may be strong enough to cure the infection without destroying the hair. If too little irritation results from a 10 per cent solution, it may be used in greater strength.

Mechanical epilation is highly recommended by authors of the prerontgen era, but it is tedious and a difficult job. Only a small area can be epilated at one sitting and it is sometimes impossible to remove the diseased hairs, because they break easily. Shaving or chemical epilation were also used. Epilation by roentgen rays is a much more satisfactory predule to treatment; but the treatment following it must never be irritating. It is limited to the application of mild antiseptics like tincture of iodine and is stopped when the skin begins to show too much drying.

With any method, frequent scrubbing with soap and water is indicated and the hair of the whole head should be kept clipped short to allow inspection and the detection of newly infected spots. This should be kept up for several months after apparent cure of any case of ringworm of the scalp. The English dermatologist Crocker said of the treatment of ringworm of the scalp. "I know of only one certain remedy; namely, persistence."

# RINGWORM OF THE GROIN

This is a disease that frequently attacks in epidemic form the students of universities and preparatory schools. It occurs on the inner side of the thighs near the body, often spreading to the scrotum, the abdomen, the perineum, and to the buttocks. The hairs do not fall out, thus differing from the ringworm that attacks the scalp and other parts of the body. There is slight itching and burning, but the disease may go on for weeks and even months without very much disturbance to the patient. The most frequent causative organism is Epidermophyton inguinale. It does not tend to recovery and will persist until properly treated. In fact, the therapy outlined in most of the books on skin diseases is tediously ineffectual. The statement is often made that a cure of the infection requires weeks and even months of treatment. Consequently ordinary management of this disease is usually unsatisfactory.

The following treatment is one which has been found effectual and curative in a short space of time. It has been successful in cases in which some of the milder antiseptic treatments have failed. It must be impressed on the patient that reinfection readily and almost persistently occurs, unless the greatest cleanliness of the underclothing and even trousers is inaugurated. The infection is evidently transmitted from patient to patient from closet seats. Dirty jock straps and suspensory bandages used in athletics are persistent transmitters of the disease. Therefore, clean clothing must be worn after all the washable clothing has been boiled and the trousers have been properly cleaned and properly ironed. Closets must be rendered aseptic by frequent cleaning with mercuric chloride.

#### TREATMENT

The patient should be instructed to come to the office, bringing clean drawers and a clean shirt, so that after the antiseptic treatment he can put on clothing that is not infected. The different steps in the antisettic process are as follows:

- The parts are all thoroughly cleansed with a soft brush or cotton, and liquid soap, and the skin for four or five inches distance from the infected areas should also be cleansed with this soap. The scrubbing should not be severe, as the skin must not be broken and the evidermis not too severely removed.
- 2. The infected area should then be wiped over thoroughly with a 2.5 per cent phenol solution. This will slightly anesthetize the parts to which the stronger antiseptic must be applied.
- 3. A cotton swab is now wet with solution of formaldehyde. This is then lightly swabbed over all the infected parts which are kept wet for three minutes, provided the patient can stand the burning pain for this length of time. If there is an area that is especially red and inflamed and sensitive, this part may be swabbed, with the next solution mentioned, before the three minutes have elapsed.
- 4. The whole area to which the formaldehyde solution has been applied is now thoroughly washed with

the 2.5 per cent phenol solution. This quickly relieves the pain caused by the formaldehyde application.

5. After the burning pain has ceased, the skin is gently dried and talcum powder is dusted over it. The patient then dresses in his clean clothing and takes care that he does not come in contact with any infected garments, beds or closest.

6. After twenty-four hours the patient should report for observation. If severe irritation has been caused by the formaldehyde solution, a 2 per cent phenol ointment should be applied. If there is not severe irritation or inflammation, the simple talcum dusting powder is

to be freely used.

7. At the end of a week the patient is again examined. If there are any recurrent small areas, which may happen at the margins of the affected region, these are again touched with the formaldehyde solution.

By this process a cure may be expected immediately and certainly within two weeks. The success of the antiseptic treatment is certainly far in advance of that obtained by the ordinary care of this inveterate disease.

The preparations advised are as follows:

M. Sig.: 2 per cent carbolic acid solution.

M. Sig.; Official formaldehyde solution

# RINGWORM OF THE FEET

Probably 75 or 80 per cent of the adult population have ringworm of the feet either by clinical or by laboratory examinations. Of course, only a small percentage of people have it in a serious or semiserious condition. Severely infected persons test the therapeutic skill of the ablest clinicians.

The solution used for preventing the spread of ringworm in schools, solution of chlorinated soda, diluted to contain 1 per cent of sodium hypochlorite, may be successful, or a 5 per cent solution of thymol in alcohol, The boots should likewise be rinsed afterward. In case of the hypochlorite treatment, the rinsing should be with water; in case of thymol, which irritates some skins, the excess should be removed from the boots by

rinsing with alcohol

Shoes may be furnigated by inserting in each a piece of blotting paper on which a teaspoonful of strong formaldehyde solution has been poured. They should be wrapped up tightly in paper, left for at least twentyfour hours, and then aired thoroughly before being worn. Silk and wool may be soaked, after washing, in a 1:1.000 solution of corrosive mercuric chloride for a day, and then carefully rinsed before drying. There is no need of destroying clothing. Much of the supposed reinfection is possibly recurrence from organisms hidden in the skin. Treatment should be continued for a

long time after apparent cure.

Roentgen treatment is efficient and safe in expert hands. The dosage must be varied, depending on the type of involvement. In acute vesicular cases, the roentgen rays are of great value in controlling the acute attack. Suitable local treatment must always be used in addition to roentgen rays. Ringworm of the nails is seldom cured. From three to six suberythema doses of roentgen rays at monthly intervals combined with full strength Whitfield's ointment applied daily to the nails is effective in many instances. Most cases of chronic ringworm of the toes will respond to 3 per cent salicylic acid and 5 per cent sulphur precipitate in petrolatum applied every night or every second night and a drying astringent dusting powder applied during the day. A good powder consists of equal parts of tannic acid, boric acid and zinc oxide.

A severe acute vesicular attack is best treated with baths of potassium permanganate solution 1:2,000. twice daily. Discrete or grouped vesicles on the sole respond well to the application of 5 per cent chrysa-

robin in solution gutta percha N. F. IV.

The "vaccine" called trichophyton has not yet been accepted by the Council on Pharmacy and Chemistry, The vaccine must be injected intradermally, In secondary eruptions actually proved to be due to a fungus of the trichophyton group, favorable results

following the injections have been reported in some cases, but the therapeutic use of the vaccine is still in

the experimental stage.

B. Levine (J. A. M. A., Dec. 30, 1933, p. 2109) used phenylmercuric nitrate in the treatment of 262 cases of tinea and yeast infections of the skin. It was used in ointment and lotion form in strengths varying from 1:1,500 to 1:1,000. Two hundred and five patients were cured. The remaining 57 were improved. When irritant effects occurred, these cleared up on withdrawal of treatment or substitution of a less concentrated mixture.

# IMPETIGO CONTAGIOSA

Pus infection of the skin, usually of the staphylococic type, is an exceedingly troublesome condition. Crusts should be removed by the application of moist dressings, bathing with warm water, or mild friction with gauze. In young children, scratching should be prevented by the application of bandages or suitable splints to prevent bending the elbows. Ointment of ammoniated mercury is usually recommended for this condition. The official ointment is 10 per cent strength. Sutton declares that this preparation is too strong for the most effective use and he finds an oily preparation better than a fatty one, viz.:

If deemed advisable, compresses may be soaked in this solution and kept in place over the affected areas by means of bandages or adhesive plaster. In the hairy parts of the body, as in the beard a continuous application of this solution for twenty-four hours will loosen all crusts and allow the antiseptic or reach the germs of infection, and will inhibit the spreading of the disease.

Morrow (J. A. M. A., July 21, 1917, p. 176) treats the areas underlying the crusts by painting with 20 per cent silver nitrate solution. This, he points out, has the two disadvantages of some painfulness and staining of the skin. Because of the reliability of the method he believes that the objections may be disregarded.

New lesions can usually be prevented by washing with boric acid solution, or with a weak mixture of mercuric chloride. Still, the patient should always be examined carefully and often, in order that new lesions may be recognized in their first stages and promptly aborted. A dusting powder, preferably one containing ammoniated mercury in the strength of 6 to 10 per cent, and boric acid powder up to from 15 to 20 per cent, is applied following the use of silver nitrate. When the impetigo is on the uncovered part, even without the silver nitrate having been used, the powder form of treatment may be selected in preference to a grease. Adults who have the infection on the face should not shave until all active signs of it have disappeared and they should not subject themselves to strong wind

Unna (Berl. klin. Wchuschr., 1915, p. 453) says:
"No true pus occus affection of the skin, no isolated furuncle, no felon, should be taken lightly. When any of these have lasted any time, true pus occi are already installed in the neighboring apparently sound hair follicles, ready to start new impetigo or furuncles. They must be walled off from the rest of the skin with a rampart of occus-festroying substances." For this he uses mercury-phenol plaster, or a zinc-sulphur-calcium carbonate-turpentie paste. A nother formula contains 10 parts of washed sulphur, 10 parts of cal-cium carbonate and 80 parts of zinc ointment.

Before applying any of these preparations Unna washes the lesions and after drying touches them lightly with concentrated phenol on the suppurating points and also on the roots of the hair around the spot. In case of extensive prodermia, all the pustules are opened and the entire body is rubbed long and thoroughly with soap. He states that any soap will do except tar soap, which, he believes, breeds folliculitis. All the pustules, then, and their environment, are covered with zine paste and gauze, as maceration of the skin from friction of any kind promotes spreading of the impetigo.

James J. Swenson and Seymour R. Lee (J. A. M. A., June 13, 1931, p. 2081) assert that impetigo contagiosa in nurseries for the new-born has become a

serious problem of the modern hospital. It is practically impossible to prevent the occurrence of sporadic cases of the disease in these nurseries. Constant vigilance in the detection of progenic infections in attendants and patients and a nursery technic discouraging the development of prodermic infections in new-born infants is the price that must be paid for the prevention of epidemics of the disease. They think epidemics are best controlled by a three nursery system which segregates infected babies, exposed babies and unexposed babies from one another.

Their plan of treatment is to open each vesicle with a cotton applicator dipped in alcohol and to swab the base of the lesions with a 5 per cent solution of silver nitrate. A dusting powder containing mercurous chloride, 3 parts, talcum, 2 parts, and zinc oxide, 1 part (after the formula of Rood Taylor), is then applied.

# BARBERS' ITCH AND SYCOSIS

Barbers' itch is a popular name for any infectious disease of the skin of the bearded region. Impetigo contagiosa, including sycosis vulgaris, the form named after Bockhardt, caused by bacteria, the intend form of sycosis, and the rare disease called lupoid sycosis are most properly designated barbers' itch; but syphilis, lupus vulgaris, lupus erythematosus, actinomycosis or blastomycosis, occurring in the bearded area, might be so named by the public. Only the former group will be considered in this discussion.

Impetigo contagiosa according to Stillians is characterized by initial vesicles arising from apparently normal skin, the vesicles quickly becoming pustular and bursting, leaving an erosion, which is soon covered by a thin crust, typically covering the whole erosion so that it seems stuck on with edges slightly upturned. In rare instances the pustule does not burst but the contents are absorbed and the roof sinks down and becomes part of the crust. When the crust falls, a red macule is left, which slowly fades to the normal skin color. There is no scar. In the meantime other lesions have appeared wherever the infection has been carried by the fingers or other means, often by the razor or shaving brush, in the bearded region. Sometimes circinate figures are

formed by peripheral extension of the bulla with central healing. In other cases the bullae may become quite large.

Bockhardt's impetigo is a very superficial folliculitis. The lesions are small. It is more often confined to the bearded region than the common form of impetigo, which tends to involve other parts of the face, scalp,

hands and other parts of the body.

Both forms of impetigo are superficial processes, usually vielding readily to simple antiseptics, as ointments of ammoniated mercury in a strength of from 2 to 10 per cent. In stubborn cases, painting the erosion with a solution of silver nitrate, from 2 to 5 per cent, may hasten cure, the ointment being used on the skin between. In those sensitive to the mercurial, gentian violet, in 5 per cent aqueous solution. may be painted on twice a day. The secret of success in treatment is to watch for new lesions to treat them promptly, and to warn the patient of the danger of spreading the infection by means of the fingers, towels or razor. Shaving should be omitted during the course of disease, the beard being clipped instead. All cleansing operations should be first carried out on the noninfected part of the face, the infected part treated last. and the hands, towels and scissors carefully cleansed afterward.

Sycois vulgaris, infection of the hair follicles by pus organisms, is often confused with Bockhard's impertigo; but sycosis is much deeper, causes swelling of the skin and loosening of the hairs, and does not heal on simple treatment, though it may clear up temporarily. Any part of the beard may be involved, but the upper lip is a favorite site, infected by nasal discharges. Frequently this is the only part infected at first. The characteristic lesion is the follicular pustule on a base of swollen, reddened skin. From day to day the infection varies in severity, at times almost clearing up, leaving only a few papules to mark the site, then suddenly becoming severe again.

In contrast, tineal sycosis is more apt to involve the neck below the angle of the jaw and seldom is seen on the upper lip only, though a few such cases are on record. Instead of the ill defined patches of erythema studded by pustules, ringworm sycosis usually forms sharply defined patches, round, oval or polycyclic, sometimes becoming circinate by central clearing, but more often forming patches composed of granulomatous tumors from which pus oozes in many places, corresponding to the kerion Celsi seen in the scalps of children with ringworm infection. These violently inflamed patches are due to infection with large spored ringworm, often Trichophyton gypseum, to which the skin reacts vigorously and establishes a considerable immunity, killing a large part of the organisms. For diagnostic purposes the hairs from the edge of the patch should be examined, for those in the center frequently do not show organisms. Because of the violent reaction, these cases yield to treatment more readily than bacterial sycosis. Discovery of the organisms about the root of the hair after soaking the specimen in 10 per cent potassium hydroxide for from a few hours to three days is usually possible. The tumor-like character of the infected areas and the unilateral or at least asymmetrical distribution are important differences from the bacterial form of sycosis. Ringworm of the beard is comparatively rare.

Lupoid sycosis is a rare disease in which large circinate lesions, sometimes occupying the whole cheek, are seen. The center is formed in part at least by atrophic or deep scars, the active border only a few millimeters in width, formed of papules, vesicles and

pustules. It is highly resistant to treatment.

Treatment is much the same for all forms of sycosis. Wet dressing of solution of aluminum acetate, I part to I5 parts of water, or saturated solution of boric acid or surgical solution of chlorinated soda are indicated for the pustular conditions, these being alternated with ointments of ammoniated mercury, sulphur or resortion for the bacterial diseases, salicylic and benzoic acid for the tineal infection. Tincture of iodine is one of the most useful applications but it should be weakened to 50 per cent strength with alcohol for most cases and should not be alternated with mercurials for fear of producing dermatitis venenata. In some cases this may be done intentionally on a small area, the violent inflammation aiding in recovery.

Shaving must be prohibited, the beard being clipped instead. All infected hairs must be epilated each day. In some cases such treatment, if kept up for several months after apparent cure, may be successful. Too often, however, the condition recurs as soon as the treatment stops.

Mild treatment with roentgen rays in divided dosage. one-fourth erythema dose once a week, may clear up sycosis vulgaris. With it only the milder forms of antisentic treatment should be used, as 5 per cent ointment of ammoniated mercury, alternating with cool wet dressings of solution of aluminum acetate. If twelve weeks of such treatment fails to cure, more vigorous measures must be taken, complete epilation of the affected parts. This may be accomplished by radium or roentgen rays. Thallium acetate, even in half dose, as suggested by some, is too dangerous to be given to adults. In cases in which roentgen rays in divided dose are given, a month or more without treatment should be insisted on before attempting epilation. The patient must understand that there is some danger of later atrophy of the skin, and his signature to a release may be of value.

Two methods are recommended by G. C. Andrews (Diseases of the Skin, Philadelphia, W. B. Saunders (Company, 1930, p. 516), the divided dose method, one-fourth erythema dose through 3 mm. of aluminum every third day for four doses, then a fifth irradiation of the same strength a week after the fourth. The massive dose, seven-eighths erythema dose in one application, through 3 mm. of aluminum may be preferred. The hair comes out in about three weeks. Remaining hairs must be epilated mechanically and then the use of antiseptics begun, for the epilation is only preparation for the real treatment intended to protect the new hairs from becoming infected.

Tincture of iodine, at first diluted to half strength, later in full strength, may be applied daily until the skin becomes dry with a tendency to fissure. Then an ointment is used, Whitfield ointment, 2 per cent salicylic acid and 4 per cent benzoic acid in ointment of rose water, for the tineal sycosis; or sulphur and resorcinol, of each 3 per cent, in the same base for the bacterial form of the disease. Some such application

must be kept up until the new hair is well grown. If small focal recurrences show themselves, mechanical epilation and stronger antiseptics must be used. Treatment should be kept up for at least a month after all signs of the disease have disappeared. Then the patient should report regularly for several months for inspection.

No possible means of increasing the good health and resistance of the patient should be neglected. A generous, well chosen diet, containing plenty of vitamins, regular exercise outdoors, sunlight or ultraviolet radiation, regular hours of sleep and an effort to get rid of any focal infection other than that in the beard are essential. Even the most thorough and painstaking treatment often fails to cure these cases.

### **PSORIASIS**

Psoriasis has been variously attributed to an infection, to errors in metabolism, and to disease of the glands of internal secretion. An inherited tendency seems evident in 5 or 6 per cent of the cases. Anything causing internal disturbances is liable to aggravate the condition or to bring on attacks, especially digestive disturbances, abuse of coffee, tobacco or alcohol, a diet too rich in albumin, or constitutional disease. When diabetes and glycosuria can be excluded, benefit is often derived from a vegetarian diet. It is doubtful whether any of the theories as to the cause of psoriasis are supported by conclusive evidence.

# TREATMENT

In treating psoriasis, various new methods have been proposed and tried in the last few years, but none of them has proved of great value. In general, chrysarobin ointment still remains the most effective remedy for cleaning up psoriasis. The custom today is to use it in rather dilute strengths—2 to 5 per cent chrysarobin in some ointment base. The lesions can often be cleaned up with roentgen rays, but the method is not to be recommended unless used with great caution. As a rule, the eruption recurs after roentgen ray exposure, as after all other methods of treatment. Another recent remedy is exposure to highly actinic rays of light. Sometimes ordinary subluvning will clear up psoriasis,

and exposure to ultraviolet rays may do the same thing; but as a rule this method of treatment is disappointing. Autoserotherapy is another suggestion, but it has not yet been proved of value. The same can be said of the handling of psoriasis with vaccines.

### ARSENIC

In chronic cases when the disease has passed the stage of acute hyperemia, arsenic may be given in the form of potassium arsenite (Fowler's solution) 3 to 10 minims (0.18 to 0.60 cc.), three times a day or as arsenous acid, in pills.

Arsenic should not be given when the eruption is active and increasing. When it has been given to full physiologic effect, as evidenced by pain in the stomach, nausea, vomiting, diarrhea, puffiness or redness of the eyes, or albumin in the urine, it should be stopped for several days.

The salicylates, alkalis and diuretics have also been recommended for internal use in psoriasis in some cases, and thyroid and potassium iodide have seemed sometimes to yield good results.

# FOREIGN PROTEIN AND ULTRAVIOLET IN PSORIASIS

Foreign protein therapy has long been used with benefit in stubborn cases of psoriasis. It alone will not clear up the eruption but will often render the case amenable to local therapy to which it was previously resistant. The mildest form of such therapy is injection, intramuscularly, of the patient's own blood. This is extolled by some dermatologists as more effective than intravenous injection of typhoid vaccine. From 5 to 20 cc. of blood is drawn from the vein and immediately injected into the gluteal muscles in the upper outer quadrant of the buttock. The treatment is given every fifth day and continued for from five to twenty times. It sometimes causes a mild febrile reaction. Other mild forms of foreign protein therapy are the intramuscular injection of sterile milk preparations and hypodermic injections of vaccines. Some authorities praise the action of vaccines made from the organisms isolated from the patient's stool, testing out the various vaccines and using for treatment those which cause a reaction in the patient's skin.

For intravenous injection, typhoid vaccine should be used because its reactions are controllable. Enough to cause a definite but not severe reaction should be given. In conjunction with this, as with the milder forms, local therapy must be used. Crude coal tar ointment and neorobin are deaner than chrysarobin and as effective in most cases. With any local application, the mildest that will be effective should be used. A hot bath before application of the ointment is helpful. Grindon reports the clearing of psoriasis in some cases by the use of two hot sodium bicarbonate baths daily, a half pound of the soda being used to the bath and the patient remainine in the hot water for an hour each time.

The combination of ultraviolet radiation and crude coal tar ointment suggested by Goeckerman is perhaps the most popular method of treatment among dermatologists at the present time. The ointment used by him was that recommended by C. J. White: crude coal tar, 2 Gm.; zinc oxide, 2 Gm.; corn starch, 16 Gm., and sufficient petrolatum to make 32 Gm. This must be made by mixing the first two ingredients, then the last two, and then mixing the two mixtures, making a black ointment. After a hot bath at night, this is rubbed well into all the lesions. The next day, before the ultraviolet ray treatment, it is largely removed with olive oil, leaving a light film on the lesions. This film is in some way activated by the irradiation, so that its effect on the psoriasis is enhanced. After the treatment the patient may take a bath and remain free from ointment until before retiring, when he applies it again, preparatory to the same program for the next day. This treatment is best given in the hospital but can be modified for ambulatory patients. If the patient cannot leave the ointment on his skin during the daytime, a thin film may be applied just before the ultraviolet treatment. Treatments are given as frequently as the circumstances of the patient permit. If spots of coal tar ointment get on the clothing, they should not be washed with soap and water but should first be wet with oil or kerosene for several hours, after which they can be washed out.

# LOCAL TREATMENT

The scales may be removed by scraping with a sharp curet and washing with hot water and green soap, or in hot baths containing 4 Gm. of sodium bicarbonate to each gallon of water. A stiff brush may be used If the scales are hard and there is thickening a 5 per cent salicylic acid ointment will aid in softening and removing them.

Chrysarobin is the remedy of chief reliance in removing the patches. It may be applied in the following manner:

B. Chrysarobini 3 5i Actheris or Alcoholis q. s. ad solutionem Collodii 25j M. Sig.: Apply at night with a camel's hair brush.

Chrysarobin should not be used on the face and it should be remembered that the stains which it makes on clothing cannot be removed.

An ointment containing chrysarobin and salicylic acid (Dreuw's ointment) may be applied over small areas on severely indurated lesions. The formula is:

Chrysarobin may also be employed in a gutta-percha paint like traumaticin.

When there are patches of psoriasis on the face or scalp only the white precipitate ointment should be used, as the chrysarobin is likely to give rise to severe erythema and edema in these regions.

It is best not to persist too long with any one remedy. Ointment of ammoniated mercury, 5 to 10 per cent, may be of value, and tar, sulphur and betanaphthol have likewise formed the chief ingredients of curative ointments.

## DIET

Many patients with psoriasis are greatly benefited by a vegetarian diet. The intake of all nitrogenous foods should sometimes be limited. Alcohol, highly seasoned food, salted meats, pastry and sweets should be forbidden. There is probably no skin disease more difficult to treat satisfactorily than psoriasis. A competent dermatologist can produce excellent results by systematic treatment, although a real "cure" of the condition is unknown.

#### **ECZEMA**

Eczema is a nomicrobic inflammation of the skin, occurring probably from a number of different causes, external and internal, of a toxic, digestive or nervous nature. The condition is characterized by inflammation and redness, vesication, weeping and exudation, formation of crusts and scales, ill defined lesions, surreading

peripherally and, as a rule, intense itching.

Heimann, Knowles and others have contended that eczema is synonymous with dermatitis. Knowles (J. A. M. A., Jan. 13, 1917, p. 79) found that of thousands of cases, almost one third were of definite external origin. About one sixth of all cases of this condition are caused by the occupation of the individual. Micro-organisms play only a secondary rôle in the causation of the disease. Practically every occupation and every irritant may produce an eczema. The portions of the skin exposed to the irritant determine the site of the outbreak. The eruption not infrequently extends beyond the irritated areas, at times being observed on distant parts of the cutaneous surface, and also generally over the body in certain instances. The usual type of eruption noted is the vesicular or the erythematosquamous. The eruptions last for weeks. months and years, and show a marked tendency to relapse. It is rather difficult, Knowles says, to explain the susceptibility of some persons to certain irritants. while others are not affected, except on the theory of a pure idiosyncrasy, an anaphylactic tendency causing sensitization of the skin.

Charles J. White (J. A. M. A., Jan. 13, 1917, p. 81) made skin tests with extracts of food substances on a large number of persons with eczema and found

specific sensitization. He also made examinations of the stools as to the presence of excess of fats, soaps or starches. He concludes that a goodly proportion of persons affected with eczema show sensitization to various types of food and that a much larger proportion are unable wholly to digest all the elements of the food they eat.

The etiology of eczema in infancy cannot be concisely or positively stated. External irritants are less often the chief factor in causing this condition in infancy than in later life. Errors in metabolism due to faulty diet or individual predisposition or both are facts of importance. Intolerance of excessive fat and carbohydrate by these infants is well recognized. Faulty mineral metabolism has been noted. The rôle of proteins as a causative factor has been emphasized since the introduction of the cutaneous sensitization tests. Proportionally large numbers of infants with eczema show positive skin tests. Their interpretation, however, must be made with a fair degree of caution. Many of the infants having positive skin reactions do not show positive clinical change following withdrawal of this protein from their diet. Skin reactions may be negative at times only to be positive at a later date. There is evidence that in certain cases the skin tests are negative even though withdrawal or addition of a food protein may relieve or bring on symptoms of sensitization. A positive skin reaction to milk does not necessarily entirely preclude the use of milk in the diet. Frequently milk can be tolerated after long boiling, which breaks the protein curd and coagulates the lactalbumin. If both cow's and goat's milk must be eliminated, breast milk should be obtained. Cereals, soups and vegetable purées must necessarily form a large part of the diet. Desensitization either by hypodermic or mouth administration of increasing doses of the offending protein may be attempted.

# TREATMENT

A thorough investigation of the patient's history with particular reference to occupation should be made to find out whether he is being exposed to any particular irritant. Persons who are susceptible to chapping should be careful to dry the hands thoroughly

after washing and perhaps apply regularly a protective lotion such as is described for that condition. Soap

should be used very sparingly, if at all,

The diet should be very simple, alcohol, coffee, all spiced and highly seasoned foods and large quantities of meat particularly being avoided. The bowles should move well daily. In some instances it may be necessary to test for particular sensitization to food substances as described under urticaria. Water should be drunk abundantly.

Internally drugs have no special value. Many have been tried and have seemed at times to yield good results, only to fail in the next case or later in the same case.

The dietary management of a patient is one of the most important features in the treatment of eczema. Some patients do not tolerate carbohydrates well, and in these cases a reduction of carbohydrates intake is necessary. It is advisable to examine the unine, noting any change from normal; sugar especially should be looked for. Some cases of carbohydrate intolerance, while not showing any sugar in the urine, present quite constantly an increased amount of sugar in the blood.

Other patients are intolerant of sodium chloride, and some eat excessive quantities of nitrogenous articles of food.

In persons past middle life suffering from eczema, nephritic changes should be looked for, and if present, properly treated. Other patients with eczema present an anaphylactoid if not a true anaphylactic reaction against specific proteins or proteins of certain groups, among which may be mentioned ega albumin, pork, and the protein of cow's milk. The patient himself may connect the ingestion of certain articles of diet with the appearance of the eruption. It is well, therefore, to put the patient on an absolutely bland diet, which is readily digestible and which contains little or none of the substances that experience has shown may be productive of eczema.

In some patients the predisposition to eczema can in some degree be controlled by organotherapy. However the physiology and therapeutic uses of the ductless gland substances are in general so poorly understood that it is impossible to give clearcut indications for their use, and the suggestion is offered merely as one that

they may sometimes be helpful.

Local treatment is largely symptomatic. It includes removal of crusts, antiseptic treatment if there is secondary pus infection, protection from itching and irritation, and various local preparations for cutative purposes. For removing the crusts a simple boric starch poultice is valuable. One teaspoonful of boric sacid and ½ ounce (14 Gm.) of starch are mixed into a paste with a small quantity of cold water. On this is poured 15 ounces (444 cc.) of boiling water and the mixture is well stirred. This is spread on gauze and applied to the lesions which, after softening, are removed. Until the suppuration is relieved the wet dressings of boric acid or of 1 per cent solution of aluminum subacetate (Burow's solution) may be continued.

If wet dressings are difficult to handle, antiseptic ointment such as boric acid, 4 Gm. to an ounce, or ammoniated mercury, 1 Gm. to the ounce, may be

utilized.

When the suppuration is relieved it is necessary to treat the exudative condition. Soothing antipruritic lotions and subsequently fatty preparations are most useful. Among the lotions used are the solution of aluminum subacetate, 1 Gm, to an ounce of water: phenol, 1 Gm, to an ounce of water, or camphorated chloral, 1 cc. to an ounce of water. Relief is also obtained by the application of cloths wrung out of hot water or water containing one-half teaspoonful of baking soda to a pint of water. Following the lotions a simple zinc ointment may be applied. As the weeping subsides a preparation containing a residual powder may be used such as a calamine lotion with 1 per cent phenol or solution of aluminum subacetate (1 per cent). With the lotion may be used mild ointments, such as fresh zinc or rose ointment and antipruritic combinations with phenol, camphor or menthol. Or, as a substitute, Lassar's paste with 1 per cent of salicylic acid may be tried. If it dries and cakes it may be removed with oil.

With an acute weeping eczema, local applications indicated are bland wet dressings. A dilute aluminum

acetate solution. 8 per cent aluminum acetate solution, 30 cc. (1 ounce), boric acid, 15 Gm. (one-half ounce), and water, 500 cc. (1 pirst), is recommended. The boric acid is to control the single this solution sometimes, but not often, causes. We the solution sometimes, but not often, causes. We then ings of this kind should be kept on as much of the time as possible, or continuously, until the weeping subsides and the condition is considerably improved. Then a bland preparation should be applied, such as a zinc ointment of the following formula:

The surfaces are to be kept covered with this, under dressings, until the condition improves and the weeping ceases when, perhaps, it can be simply smeared on. This can be used in place of the wet dressings when they cannot be applied. If it is an infantile exerna it may be necessary to use such dressings entirely in place of the wet ones, but when wet dressings can be used they are best, in the weeping stage.

A weeping eczema is simply a term describing an acute dermatitis in the stage of weeping. To control the condition, if the source of irritation that produced it is not temporary, it must be found and, if possible, eliminated.

None of the patent preparations for eczema are anything like as universally good for it as the applications described.

In acute papular or papulovesicular eczema the skin may be so irritable that ointments are not well tolerated. Here may be applied a mild alcoholic solution of 0.5 per cent of salicylic acid followed by the use of a bland dusting powder every three or four hours.

The starch poultice already mentioned may give relief. It should be renewed every four to six hours. After the acute condition subsides, dusting powders containing equal parts of zinc oxide and starch or tale with salicylic acid; phenol, tar, or phenyl salicylate, 1 per cent, or boric acid, 15 per cent, may be utilized. Or at this time the soothing tragacanth jelly described for treatment of chapping may be applied.

Or the following may be tried:

The skin may return to normal under this treatment. Usually, however, stimulating applications are necessary to complete the treatment and to rid the skin of the results of the inflammatory process. These must be applied with great caution, to prevent starting the inflammation anew. A small amount of tar, 7½ grains (O.5 Gm.) to the ounce, may be utilized in ointments. The quantity may be gradually increased to double or four times this strength. Tar preparations, such as the oil of cade or rectified oil of birch tar, or salicylic acid, may be added.

Other drugs used are mercury, phenol, sulphur, betanapthol or salicylic acid in ointments, beginning with weak concentrations and gradually increasing to concentrations of perhaps 15 grains (1 Gm.) to an ounce of ointment.

Lewis Webb Hill (J. A. M. A., April 18, 1931, p. 1277) reports the use of a soy bean flour preparation for replacing milk in infantile exzema. The composition of the mixture is soy bean flour, 67.5 per cent; blive oil. 19.0 per cent;

sodium chloride 1.3 per cent : calcium carbonate, 2.7 per cent. In the cases in which there was a severe sensitization to milk as shown by skin tests, good results were obtained by substituting this mixture for

the milk (Sobee, Mead-Johnson).

Old chronically exacerbating eczemas are most difficult to treat satisfactorily without all the facilities available to those specializing in the care of skin diseases. It is not wise, therefore, to hesitate long before giving patients the advantage of such expert assistance

## HYPERKERATOTIC ECZEMA OF PALMS AND SOLES

Hyperkeratotic eczema follows exposure of the hands to injurious influences such as rough weather. water, cleansing agents, chemical solutions and various traumatisms. Encasing of the feet in ill-fitting and deforming shoes, which produce callosities and breaking down of the arch, thereby increasing sweating of the soles and resulting in maceration of the keratotic, thick epithelium will also cause this condition.

Locally a plaster may be employed, containing 5 per cent salicylic acid. This is applied with the fingers and covered with zinc oxide adhesive plaster, so as to intensify its action. It is changed once in twenty-four hours. Under its use the hard callus of the fingers melts down, and the skin becomes smooth and supple. This plaster cannot be applied to the feet as it would crumple up in walking, but an ointment may be prepared of about 12 per cent salicylic acid in equal parts of hydrated wool fat and petrolatum, as follows:

Gm. or Cc. Acidi salicvlici...... 8 or Adipis lanae hydrosi..... Petrolati ......åå 30 M

This is applied in the morning, so that in walking it will be massaged into the skin. A few days later, when the patient is able to resume work, an ointment composed of one part of mercury in 99 parts of simple ointment is used. Gm. or Cc.

B Hydrarg, salicylatis..... 1

628 BOILS

The official ointment of boric acid often acts well; ammoniated mercury in 2 to 4 per cent strength in an ointment, may, in some instances, be better than the mercuric salicylate as given in the foregoing prescription. The first therapeutic indication is the removal of horny accumulation, so that the underlying inflammatory process may be influenced by the medication ordered. This can be accomplished by energetic therapp which produces maceration, for which a suitable ointment applied to a mull bandage and brought into intimate apposition with the skin is very useful.

During and after this mode of treatment it is well to use a formaldehyde ointment, because of the marked hyperhidrosis which is frequently associated with this

form of eczema.

Some of the best results in treating eczema of the soles, and especially of the palms, have been obtained by Montgomery and Culver by the use of roentgen rays, after all other methods of treatment have failed for months or even years.

# BOILS AND CARBUNCLES

These frequent and unwelcome visitors are always due to an infection. The greatest preventive is constant cleanliness of the back of the neck, the axillae, and the gluteal, perineal and genital regions, which are the parts usually affected with boils. The back of the neck is the most frequent place, in men, for boils and carbundes to occur. Infection readily develops in the hair of the lower part of the occiput and upper neck region.

A boil having occurred, contiguous hair follicles may become infected, or more distant parts of the body may develop one or more boils. Doubtless such isolated boils are frequently caused by direct transmission by scratching with contaminated fingers. Frequently furuncles occur from infection transmitted by way of the blood or lymphatics from some focus of suppura-

tion; or a boil may infect the blood and cause crops of boils and repeated attacks after periods of remission. Repeated crops of boils may occur from foci of infection in the nose, nasal sinuses, tonsils, teeth and gums; they are not as likely to develop from a suppurating ear, a fistula, or a walled-off sinus. It cannot be too frequently reiterated that foci of infection in the nose and mouth are a menace. Diabetes particularly predisposes to boils.

#### ETIOLOGY

A furuncle, or boil, is an inflammation of the deeper layers of the skin and adjacent subcutaneous tissue, generally circumscribed about a hair follicle or sebaceous gland. Staphylococcus pyogenes-aureus seems to be the most frequent germ of infection. The intruder, of course, rapidly propagates, irritation takes place, the blood vessels of the region become dilated, leukocytes hasten to the defense of the patient, and tumefaction, heat and pain develop. The affected afflicted area becomes distinctly circumscribed, and, if not maltreated, may keep the infection within the bounds of the circumscription, with-if many lymphatics are in the region-a rather rapid congestion of the adjacent glands. These also become secondary defenses against infection of the body. The pressure of the part increases, circulation in its center is interfered with, and the central part or core of the inflamed region becomes necrosed, soon softens, and breaks through the skin, and more or less thin pus, with blood escapes. This process lasts about a week. Soon after this the central dead tissue becomes loosened from the healthy surrounding tissue and is easily removed or evacuated. The cavity then granulates and rapidly heals

## TREATMENT

If a boil is first seen when it is only a slight noduce with a punctate white speck on the skin, it has long been considered that abortive treatment is advisable. The treatment most recommended has been to puncture through this white or red point on the skin into the hard tissue with a tootlipick or wooden applicator, which has been dipped in liquid planol (carbolic acid). Or, with a hypodermic needle, a drop or two of phenol ROILS

has been injected directly into the center of the hardened part. However, although many times successful, the majority of boils cannot be so aborted, possibly because they are rarely seen at this early stage.

When a boil is first seen well on its way, incision before liquefaction and suppuration should be considered, although sometimes it does not hasten the process

and may increase the pain,

The surrounding tissue of a boil should always be kept carefully cleaned with some mild antiseptic wash. One of the liquid soaps is recommended or a little ether might be used. A wet dressing may then be applied, best with boric acid solution. Gauze saturated with such a solution and placed over the part, and a piece of oil silk over it, should be gently strapped or bandaged on. The gauze should be kept constantly moist with warm water. If the skin tends to become red and irritated about the boil, it should be soothed with petrolatum or with a dilute glycerin. Strong anti-septics should not be used, except momentarily, on the skin. Dressings of mercuric chloride, so long pre-scribed and so much overused, are bad treatment for the skin in these cases.

If the part around the boil is hairy, it should be gently and carefully shaved or closely clipped, and when the skin is perfectly dry, iodine may be painted once around the part; then proper simple cleanliness

will prevent later infection of the hair follicles.

As soon as the boil is opened, or has come so near the skin that it is best to incise the outer laver of skin to evacuate the pus, it should be dressed frequently. Besides the cleansing of the skin about the part with alkaline washes, an ointment, as sterile petrolatum, may be spread around on the healthy skin to prevent the irritant excretions from the boil causing infection to healthy parts. The wet poultices should be continued as long as there is a hard, inflammatory area. soon as this induration has greatly diminished, the poultice part of the wet dressing should be stopped that is, the oil silk, rubber tissue, or waxed paper should be omitted from the dressing, and simply the moist gauze placed over the boil. This wet dressing should be frequently changed, so that no pus is dammed back into the boil and free exit is constantly possible. This

means that the dressing should be done at least twice in twenty-four hours, or better, three times,

At each dressing, any little pieces of dried pus or tissue present should be gently removed with forceps. with just enough pressure brought to bear to bring the particles of dead tissue within reach of the forceps; squeezing should not be allowed

## CARRIINCLES

It is practically impossible to determine in most instances that a patient has a carbuncle. An apparent boil is likely to develop into several boils, with several openings, and becomes a carbuncle, Carbuncles are more likely to occur in men, and are more frequent in older men than in young men, and develop more often on the back of the neck than on any other part of the body. However, wherever a carbuncle is located. on account of the large amount of tissue involved. there is always some danger from a phlebitis with thrombosis and possible direct infection of a large blood vessel

It is necessary that such a multiple infection as a carbuncle should have free opening for evacuation as soon as suppuration occurs. It may even be advisable for a surgical decision as to whether or not radical excision is advisable to prevent the constant danger of infection in one of the large veins of the head. Carbuncles on the upper lip or near the nose are

dangerous.

It should be remembered that it is always possible for a boil or carbuncle to produce septicemia, and even a serious septic process of deeper structures of the body or of bones. In other words, while the individual boil is being treated, every possible focus of infection must be sought, and if one is found, means must be taken to eradicate it. A history of repeated boils and pustulations indicates a focus somewhere and, if it is not in direct evidence, all crowned and bridged teeth are under suspicion until the roentgen ray has proved them innocent

## GENERAL TREATMENT

Anything that stimulates appetite, good digestion, proper movement of the bowels, and nutrition will aid to successfully fight furunculosis.

If the patient is anemic, iron in some form should

be given.

When there are multiple small spots of infection on the body, the underclothing should be frequently changed, and warm baths should be taken to prevent reinfection.

Stock vaccines, and more often autogenous vaccines, have been found valuable. On the other hand, sometimes vaccines fail utterly to prevent the recurrence of

boils. A recent method of treatment includes the

Arthur U. Desjardins (J. A. M. A., Feb. 7, 1931, p. 401) declares that treatment of boils and carbuncles by roentgen rays is not used as widely as it might be A review of all the published reports of such therapy shows that the majority of patients derive great and prompt benefit. Pain is relieved in about twenty-four hours, although in a small percentage such relief may be preceded by a temporary increase in the amount of pain. The best results are obtained when the lesions are treated early. Many such lesions will then never reach the suppurative stage. The dose of roentgen rays is small and usually one exposure is sufficient. In cases that do not react to the initial exposure the treatment may have to be repeated once or twice.

## ALOPECIA: BALDNESS

Several different forms of alopecia have been described, of which the following are the types:

Alopecia congenitalia is an exceedingly rare condition in which a child is born without any hair. Microscopic examination of the skin in some instances shows an entire absence of follicles. In other cases the follicles are present, and after weeks, months, or possibly two or three years, the hair grows, although it is usually finer and thinner than in the average child of the same age.

Another variety is alopecia senilis, in which the loss of hair is an accompaniment and an indication of the general atrophy of the tissues throughout the entire

body.

There is the disease called *alopecia areata*, which is characterized by a complete falling of hair from limited areas of the scalp or other hairy portions of the body.

This is a distinct disease, and will not be considered in this connection.

Ther remains the form of alopecia prematura, in which the patient loses hair, but in which this loss is not associated with the changes characteristic of old age. This kind of premature baldness is customarily divided into two classes: the idiopathic and symptomatic. In the idiopathic form few causes can be found for the occurrence, while in the symptomatic form there will be found some pathologic condition of the scalp, or some disease, which has affected the general nutrition of the entire body. Under the symptomatic type may be included the falling of the hair which so frequently follows typhoid.

Omitting a discussion of the other forms of alopecia, it is worth while to discuss at length the common type of premature alopecia.

The most that can be said of premature baldness, according to Pusey, is that it is senile baldness coming on before the usual time. Of its causes we know actually nothing. We do, however, know the sequence of events.

Between the skin of the scalp and the skull there is a thick layer of fat to which the skin is loosely attached and on which it is freely movable. In civilized man, who lives in houses and wears hats, the following changes take place as he approaches later life: This fat layer gets thinner; the scalp becomes more firmly attached to the skull and less movable; the skin becomes more tense, and with these changes the hair becomes thinner and thinner over the top of the head. Finally, in extreme cases, the hair disappears and there is left a bald, glistening crown, closely drawn over the skull. This sad picture is senile, spontaneous or simple baldness. Premature baldness is the same thing, only occurring before the age when these changes, which we ordinarily attribute to old age, are expected to appear.

What is the process that has taken place? There has been a disappearance in great part of the subcutaneous fat; the scalp has become much more dense in structure—has become fibrous or sclerotic—and with this tightening in the scalp there has been a gradual shrinking in the hair follicles until they entirely disappear, and are replaced by fibrous tissue. It is a process much like that taking place in many of the tissues in later life, and in some of the organs, often as a result of disease. It resembles closely, for example, the destruction of the epithelial tubules in the kidneys that follows chronic inflammatory processes. And it is a change that can readily be explained as a result of a chronic inflammatory process in the scalp. This is a reason for one view that all so-called senile baldness is really due to dandruff or seborrheic dermatitis. The sounder view seems to be that the change may be simply one of senile atrophy occurring as a primary process and not secondary to any disease condition of the scalp.

The explanation of the fact that haldness is usually confined to the top of the head probably is that the increased tension of the scalp resulting from its shrinkage exerts its chief pressure on the top of the head. If one pulled a bag tightly down over the head it would exert much more pressure on the top of the head than around the border.

Simple or senile baldness, in spite of its name, usually begins to manifest itself early. The thinning of the hair becomes apparent before the age of 30 in 80 per cent of the cases, and persons who are not nearly bald at 50 are likely to keep a passable covering of hair until they reach old age.

The definite causes of simple baldness are uncertain. and there is much room for speculation. As a result, all sorts of factors are invoked to explain it, from the wearing of tight hats to improper methods of breathing. Some would go so far as to say that there is no such thing and attribute all cases to seborrheic dermatitis. This is an extreme view; but certainly the ravages of dandruff have to be taken into account in all cases of baldness. In considering the causes of the condition no separation can be made between simple baldness and that due to dandruff.

Baldness is much commoner in men than in women. This is true, however, only of complete baldness; thinning of the hair is commoner, perhaps, in women than in men. There are various reasons why haldness occurs less frequently in women than in men. In the first place, women give much more attention to the toilet of the hair-to brushing it, and keeping it clean and in good condition, and second, the fat layer of the scalp, as of the skin generally, is more abundant in women than in men and atrophies later in life. Superstition has encouraged the belief that baldness is a sign of intelligence and a result of mental labor. Baldness may make one look wiser, but it occurs indifferently in the great and the small, and it is no more a sign of wisdom than long hair is of eenius.

The broad fact seems to be that in the common occurrence of baldness we have a manifestation of a transitional stage in man's evolution. The hair on the body now is the vestige of a former abundant coat. In the economy of nature, structures atrophy and disappear when they cease to have function, and the need of warmth and other protection afforded by the hair is no longer of great importance to man. Man now uses a hat instead of relying for protection for his head on a shock of hair as his ancestors did. As a result, in spite of all his coaxing, the shock of hair is gradually vanishing. This does not mean that you and I can save our hair by discarding our hats. We are a result of our ancestors, and to save our hair we would have to discard the hats of all our ancestors for scores of generations back.

According to this view, heredity is one of the great causes of baldness, and all statistics indicate that this is true. In the statistics of Jackson and of White, the condition is due to heredity in from 30 to 40 per cent

of the cases.

Mistreatment of the hair is also an important factor in the production of baldness. Daily wetting of the hair, especially if no attention is given to drying it, keeping it poor in oil by excessive use of soap and water without supplying any fat in place of that removed are a few of the misdemeanors that promote baldness. Failure to keep the hair clean, excessive exposure to sunlight, the indiscriminate use of drugs, particularly 'hair tonics,' and overzealous treatment by barbers and hairdressers—all of these are influential in the production of baldness. Therefore particularly in the care of the hair of those who have already a pre-disposition to alopecia caution should be exercised.

The effect of heavy and tight hats in interfering with the circulation of the scalp is considered to be of

great importance, and there can be little doubt that it is a factor to be considered. Hats should be light. They should provide for circulation of air and should not bind the head.

But after all other things have been considered, we must still come back to seborrheic dermatitis—dan-druff—as the most important cause, and the one to which most care must be given in preventing baldness. According to White's statistics, it is a factor, and perhaps the chief factor, in 79 per cent of the cases; according to Jackson's, in 72 per cent, and according to Elliot's, in 91 per cent.

## PROPHYLAXIS

It is apparently little considered by the average person that the hair should receive as particular care as do the teeth and nails. To be sure, it is the custom of most persons to comb their hair, but this is generally done for the cosmetic rather than for the hygienic effect. By improper care of the hair great harm can be done, and conversely, persons who desire to preserve their hair in good condition should take pains to encourage its healthy growth. Many overdo the matter of making applications to the scalp, applying strong alcoholic preparations or other so-called tonics too frequently. Others, with an excess of pains, bathe it too often, especially with cold water, as is the case with people who take a daily cold shower bath. Others indulge excessively in the luxury of a shampoo. While occasional washing of the hair is beneficial, too frequent applications of water to the hair does harm by withdrawing the natural oil from the hair and scalp. The best authorities advise shampooing the scalp not oftener than once a week and not less frequently than once a month. Probably nothing better can be used on these occasions than castile soap and warm water.

With women, the case is somewhat different. They have their special unhygienic practices which must be mentioned and condemned, especially the curling of the hair by winding it about hot curling-irons or doing it up in curling papers over night, and the permanent wave. The popular remedies to prevent falling of the hair

would fill an encyclopedia. Vibratory and electrical treatments, hair tonics that feed the hair roots, as

though they grew out of the scalp like broom-sedge out of an old field, neat's-foot oil and crude kerosene, massage and mange cures, all have their futile trials, Among them must also be included a method highly recommended by many barbers and beauty specialists. namely, singeing the hair. This is recommended to overcome splitting at the ends and to prevent falling of the hair. The reason for the latter is said to be that it "closes the pores and keeps the fluid in the hair." With the long hair of a woman which has a tendency to split at the ends, it is possible that singeing the tips may be of some use; it substitutes a charred blunt end of fused horn for one tapering to the point or cut clean across. But even in instances of this sort it is less useful than lightly greasing the hair and thus supplying the fat which is lacking in such hair. For the hair of men. which is kept short, singeing is not of any use in preventing the splitting. Hair which is not allowed to grow to its natural length does not split, unless it has a deep-seated disturbance for which there is no such simple remedy. Of course singeing the hair-ends in order to prevent the fluid in the hair from escaping, like sap from a tree, is based on an entire misconception of the hair's structure and nutrition. The hair does not contain any more san than a buggy whin; it is not nourished by any fluid in it, but by the blood plasma that reaches only the hair root. The hair above the skin surface is a spine of horn, which is even oiled from without, and singeing its tips has no effect whatever on either its nourishment or its growth. It is certain that singeing the hair is of no value in preventing its loss. In fact, the only value the procedure has is to the zealous hairdresser who gets his little fee for doing it-unless it is worth a dollar to the seeker after hair to think he is doing something, even if he is not.

#### TREATMENT

The remedy of baldness, whether due to a local inflammation of the scalp, or to the result of some general disturbance of nutrition, is a somewhat puzzling matter. The treatment adopted must be continued for several weeks, or even months, before a result of much importance can be observed. Obviously at first the constitutional condition of the natient should

be carefully inquired into, and any disturbance of it should be promptly corrected. If care and worry seem to be important factors in the disease, these should be remedied as far as possible. If the digestion is not properly performed, measures should be adopted which will correct it.

Certain internal remedies apparently have some control over the nutrition of the skin and scalp. Perhaps none surpasses arsenic in this respect, and in many instances the use of this drug will seem to contribute to a favorable result. If anemia is present, iron may be combined with arsenic. For instance:

Sig.: Take one pill, three times a day, after meals.

The question of local applications to the scalp should be approached with some hesitation. The variety of drugs which have been recommended for application to the scalp to stimulate the growth of the hair is so great that one naturally feels suspicious in regard to the value of any. This, however, must not discourage the physician from trying to select a suitable preparation which will prove of benefit to his patient. If dandruff is abundant on the scalp, one of the simplest applications is a solution of sodium borate, with glycerin and water.

This, like all preparations designed for use on the scalp or for the purpose of stimulating the growth of the hair, should be applied to the scalp and not to the hair. This may be accomplished by using a comb to part the hair, separating it so that the application may be made directly to the scalp, and when this has been made along one part, making successive applications along other parts, until the entire scalp has been treated.

Another remedy which has been extensively recommended for the relief of dandruff is resorcinol. This may be used in the form of either a lotion or an ointment.

	Gm. or Cc.				
B Resorcinolis 6	3 iss				
Alcoholis 75 or	fl3 iii				
Aquae	fl3 viii				
M. Sig.: Shake and apply to the scalp twice	a day.				
0					
Or:					

These remedies are especially valuable when there is any evidence of inflammatory action in the scalp because of their soothing and anti-inflammatory action. In these cases preparations which are stimulating should be avoided. If there is no evident pathologic process going on in the skin except the falling of the hair, more stimulating remedies may be applied. Of these the most important are alcobol, quinine, cantharides, and ammonia water. These, with resorticnly, which has been already mentioned, are the fundamental ingredients of most popular hair tonics. Bay rum, a favorite application to the hair with many persons, owes its pleasant effect largely to the alcohol contained in it.

The tincture of cantharides is often combined with alcohol and castor oil, as in the following prescription:

		Gm. or	Cc.	
Ŗ.	Tincturae cantharidis	101		fl3 iii
	Olei ricini	5	or	fl3 iss
	Alcoholis		••	fl3 iv
M.	Sig.: Apply externally.			

When mercuric chloride is used the proper strength is 1 part to 2,000 or 3,000 of water.

A sulphur ointment may sometimes be used with advantage.

### HRTICARIA

The causes of simple urticaria are food (protein) poisoning, intestinal parasites, poisoning by certain drugs, disturbances of the liver or kidneys, and gout. Conditions associated with an increased amount of uric acid in the urine, constipation, an abnormally dry skin, and, in fact, anything that impedes normal elimination

encourages urticaria. Circulatory disturbances, especially when combined with high blood pressure or arteriosclerosis, may be factors in causing urticarial eruptions.

Urticaria may occur, however, from almost any feverish condition or from any infection, and simply

becomes, then, an added symptom.

Fred Wise and Marion B. Sulzberger (J. A. M. A., Nov. 15, 1930, p. 1504) report a case of urticaria due to trickophyton, the mycotic infection being present on the feet. T. Preston Churchill (J. A. M. A., Dec. 27, 1930, p. 1975) reports a case of urticaria due to bedbug bites; Thomas H. Miller (J. A. M. A., March 7, 1931, p. 772), a case due to monoiodo-cincophen, and L. Minor Blackford (J. A. M. A., Feb. 14, 1931, p. 252), a case due to cold sensitization.

The following treatment of simple urticaria is generally efficient, namely: catharsis, a limited milk or cereal diet, large amounts of water, the administration of alkalis, such as potassium citrate in 2 Gm. (30 grain) doses, given four or five times in twenty-four hours, or some other alkali, if preferred. Potassium

citrate may be given as follows:

If it is known that the stomach and intestines have been irritated, bismuth subcarbonate and sodium bicarbonate should be administered, and, if the patient does not quickly recover, some form of calcium should

be given.

The patient should be kept cool. Thin and nonirritating underwear should be used. If the patient is a child or one in whom the condition tends to recur, linen or silk underwear should be worn. Warm baths, the water made alkaline with sodium bicarbonate, are soothing to urticarial patients, and will relieve the itching. The skin should not be rubbed, but should be mopped, lest the drying process cause irritation and more itching. The localized spots may be sprayed with alcohol, cologne, or even mild acid applications, such as vinegar. Phenol solutions have long been used to dull the irritability of the peripheral nerves; a 2 per cent solution, with or without glycerin, often suffices, as:

M. Sig.: Use externally as a lotion. [Shake well, and label as a poison.]

Sometimes such applications as hemanalis (extract of witch-hazel) or a bland oil like almond oil will be soothing to the irritated skin. If the urticarial spots are not present in large numbers, such applications as camphor or chloral hydrate, with or without menthol, are frequently of value, as:

M. Sig.: Use externally. [Shake, and label as poison.]

R Camphorae
Chloralis hydratis ... \$\frac{1}{42}\$
Mentholis ... 1 or gr.xv
Glycerini ... 25
Alobelis ... 4100 fl.ii.

Alcoholis ......q. s. ad 100 fl5 iv

M. Sig.: Use externally. [Shake, and label as poison.]

Various dusting powders are often of benefit, especially in children suffering from this condition. The simplest is powdered starch or a talcum powder. Sometimes zine stearate, with or without menthol, is of value as tending to adhere to the region that is irritated. A simple formula frequently recommended is Anderson's dusting powder:

| Gm. or Cc. | 3 vi | 24|0 | 3 vi | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 27|0 | 2

When urticaria continues or recurs, as it does occasionally in its milder forms, the whole physical condition, diet and personal hygiene of the patient must be very carefully investigated. Some disorder will be found, and when it is corrected the disturbance will

disappear. Especially must the intestinal digestion be studied. If constipation or indigestion is present, measures to prevent the absorption of the irritants will generally cure the urticaria. Occasionally in young or older persons in whom a high tension or arteriosclerosis has begun or who have kidney disturbances, conditions of the skin exist that cause temporary reddening and perhaps itching, with the least irritation. The patient may be tested as to his sensitivity to various food substances. Beginning with a simple milk diet and gradually adding one article after another eventually he would find the one that invariably produces recurrence of attacks. Skin tests with extracts of various proteins may disclose a food that is at fault,

The skin may be so hypersensitive as to allow the condition termed "dermographia." This condition is a pseudo-urticaria, and the treatments that tend to relieve

urticaria will generally relieve this condition.

When there are angioneurotic edemas, a diminution of the sodium chloride in the food will often be a valuable adjunct to the other treatment inaugurated. This is especially true if the kidneys are at all insufficient.

Giant urticaria, on the other hand, is a serious, dangerous disease, especially if it attacks the face and mouth, as, when present elsewhere, it is likely to do at any moment, and dangerous swelling in the throat and larynx may occur. This condition should be treated energetically, and the patient should be under close observation.

The treatment of giant urticaria is catharsis with calomel and saline cathartics; a milk diet, if milk agrees with the patient; or a plain water diet, or a cereal diet. Calcium lactate may be given in doses of 1 Gm, (15 grains) every four hours, and alkalis in large doses. Occasionally, large doses of quinine, such as 10 grains (0.6 Gm.) twice a day, or good-sized doses of antipyrine, as 1 Gm. (15 grains) three times a day, have seemed almost specific. Atropine pushed to physiologic action is sometimes of value. Sometimes an injection of epinephrine in doses of 0.5 cc. of the 1:1,000 solution seems to have some influence in controlling the eruption. The exact cause of this serious condition has not been determined. Doubtless, however, it is anaphylactic and due to protein poisoning.

## ROENTGEN RAY DERMATITIS

The wide use of the roentgen ray in the treatment of various diseases has led to the occurrence of roentgen ray burns with dermatitis and severe rapidly growing new growths. Caldwell, Abbe and others are convinced that the most practical, easiest applied treatment is radium. The application of radium is free from pain and under its influence the lesions seem to retrogress. The effectiveness of the freezing methods and of the electric-spark methods cannot be questioned. but they are both painful. Sparks can sometimes be applied in situations impossible to reach with liquid air or carbon dioxide snow. Of the two methods, freezing is somewhat less painful. The value of surgery in such cases has been demonstrated beyond any shadow of doubt, but these operations are dangerous and they call for exceptional surgical judgment and technical Under the best conditions excision cannot be safely done ordinarily without sacrificing healthy tissue. The possibility of hastening metastasis must always be considered.

Dodd has found the following application simple and efficacious in the treatment of the ordinary acute reaction following roentgen ray exposure:

		Gm. or Cc.	
Ŗ,	Zinci oxidi		5 i
	Phenolis		3 ss
	Glycerini	4	3 i
	Liquoris calcii hydroxidi	200	3 viii
M			

This mixture should be shaken well and applied to the area for from five to ten minutes, two or three times a day. All heavy dressings should be avoided and, when possible, the lesion should be exposed to air. This remedy should not be applied on a dressing, but should be patted on and the air allowed to get to the lesion.

À valuable lotion in these cases is solution of aluminum subacetate (Burow's solution), 1 part to 15 parts of water. It may be used in the form of a wet dressing. Between attacks the hands may be kept soft by application of some bland preparation such as ointment of rose water.

## CHAPPED HANDS

The chief reason for chapping of the hands is the lack of fat in the skin in cold weather. Fat production in the skin is at a minimum in cold weather. because of the diminished sebaceous and sweat secretion. This and the dry air of winter make the skin dry and vulnerable at the very time when the cold air itself is irritating. This combination leads readily to chapping if the hands must be exposed much to soan and water, and particularly if the irritation of antisentics is added, as in the case of physicians and nurses,

The first thing to do to prevent or overcome the condition is to supply, by greasing the skin occasionally. the fat lacking in the skin. Almost any bland fat or semisolid hydrocarbon will do for this purpose, but nothing is better than a well made ointment of rose water. The next and more difficult thing to do is to avoid soap and water-especially soap-as much as possible; and it is here that hand lotions serve a useful purpose.

Hand lotions are generally of two types: (1) glycerin solutions of the glycerin, rose water and benzoin kind, and (2) gelatinous liquids made with tragacanth, quince seed, or some other water-soluble colloid. The glycerin lotions are effective with some skins and are the most satisfactory to an occasional person. a rule they are not the best, first, because the glycerin tends to make drier a skin already too dry and, second, because these lotions have little or no detergent effect and do not clean the skin

The tragacanth and quince-seed lotions are better, and of these the tragacanth preparations are certainly as good as any other and are cheap and easy to make. A formula for such a lotion given by Pusey is as follows:

	Gm. or Cc.					
B.	Tragacanth	4	3 i			
	Glycerin Boric acid	60	5 ii			
	Waterq. s. ad	12] or 500	0:111			
	Oil of bergamot	60	gr. x			

The oil mentioned is added as a perfume and might be omitted, according to the wish of the prescriber.

The boric acid, glycerin and water are first mixed, the tragacanth is added and the mixture is agitated until the tragacanth is dissolved. This makes a rather thick mucilage and it can be changed to any consistency desired by a slight increase or decrease in the amount of tragacanth.

A lotion like this has a considerable detergent effect. It is a fair substitute for soap, and if it is freely rubbed over the hands and wiped off, either with or without the use of water, it cleans the skin of all but the most tenacious dirt. It, of course, cannot be effectually used as a complete substitute for soap. Such a lotion has the advantage over soap that it not only is nonirritating to sensitive skin but is also bland and soothing. It thus tends to prevent and eventually to cure chapping of the hands.

## CHILBLAIN

The conditions favoring chilblain are impaired and weak circulation. Hence it is seen chiefly in the lower extremities, especially in the feet, but may affect also the fingers, ears, nose and cheeks, parts especially exposed to the cold.

The principal manifestations of the disorder are a burning heat, with itching and redness. These symp-

toms are usually worse at night.

Rapid change of temperature or prolonged exposure to cold, and especially to cold combined with dampness and moisture, undoubtedly produce slight histologic changes, of an inflammatory character, in the cutaneous structures. These have been designated by some writers as chronic erythematous dermatitis.

Relief is sometimes obtained by painting the affected area with equal parts of incture of iodine and tincture of opium. Oil of peppermint diluted with one to six parts of giveerin has been recommended as affording

relief.

Prophylactic measures may be taken against chilblains before the advent of cold weather, or between exacerbations. The patient should be instructed to wear warm, loose woolen stockings and warm shoes. The feet should be bathed in warm water daily, and after the bath should be rubbed briskly, quickly dried, and dusted with a bland powder.

When the chilblains have developed, more active treatment should be employed. If the patient's general health is below normal, bitters are indicated. When the condition is acute, it is well to use soothing lotions. as a calamine lotion, freely for a time. In the less acute cases, the greatest improvement is usually obtained with the use of stimulating applications, but the large number of these which have been recommended shows that no one of them is successful in all instances. Rubbing with oil of turpentine, pure or diluted, with camphorated soap liniment or with phenolated oil, is sometimes advisable. In the stubborn cases, the use of the galvanic current has at times produced a favorable effect, the positive pole being applied to the affected part, the negative pole to a neighboring region, near the truncal nerve.

If the chilblain undergoes ulceration, it should be treated as any other ulcer.

When the inflammation proves resistant to treatment, the possibility that the condition is something more serious than chilblains, perhaps either lupus erythematosus or Raynaud's disease, must be considered.

Hot air therapy has been found of value when the condition is of long standing.

The following simple combinations may be of benefit for chilblains, painful corns or humions:

M. Sig.: Apply a small quantity frequently, rubbing in until absorbed.

M. Sig.: Use externally.

Deep vigorous proximal massage of the whole limb with the use of any desired lubricant—the medication probably is unimportant—and with brief, slow, gentle kneading of the affected part is probably the most important item. Immersion in a warm foot bath, followed by a dash of cold water, may well precede the rubbing. Periodic reversal of the galvanic current while the feet are immersed in warm water adds to the value of this exercise to the blood vessels. A cool evaporating compress, most especially at bedtime, gives comfort. Extremes of thermic treatment that may result in aggravation of the paretic vasodilatation must be strictly avoided.

## FROSTRITE

If chilblain is regarded as a chronic condition generally due to the action of cold, frostbite may be regarded as an acute condition due to the action of cold. When a portion of the body not properly protected is exposed to intense or extreme cold the tissues become affected. If the cold is sufficiently intense and the exposure is sufficiently prolonged the part becomes frozen. Persons in whom the circulation is weak. particularly the young, the old and the debilitated, are especially likely to suffer from intense cold. Likewise those parts in which the circulation is least active. and which are least protected by clothing, as the ears, hands and feet, are prone to suffer.

Different degrees of frostbite are recognized. In the slighter forms, the smaller arteries become contracted, the circulation becomes slow, and there is venous stasis. This is accompanied by a change in the various structures, and also in the blood contained in the vessels of the affected part.

If the cold is more intense or the exposure is more prolonged, vesicles and blisters or blebs, often containing bloody fluid, form.

Finally, if the exposure is sufficiently severe and prolonged, the entire part becomes congealed, and

freezing and gangrene result.

Locally the part becomes cold, pale, or bluish, shrunken or wrinkled, and there is loss of sensation and diminution, or entire loss, of the power of motion. Constitutional symptoms vary with the condition of

the individual and the extent of the lesion. Loss of energy, fatigue and weakness are early symptoms. These may be followed by indisposition to continued exertion, difficulty of speech, delirium, coma and death.

In outlining treatment, first consideration must be to save as much of the injured extremities as possible. As it is impossible to say how much of the injured tissues will survive, immediate or early amputation is absolutely contraindicated. The best treatment at first is friction with snow or cold water in a cold room. Changes to a warmer atmosphere must be brought about gradually. After the friction the limbs should be raised on pillows and swathed in cotton-wool, which can be held in position by bandages applied loosely so as to avoid any danger of constriction. If blisters form, or discoloration of the toes or other parts shows that gangrene is probable, the whole foot should be cleansed aseptically. Strips of sterilized gauze should then be applied between the toes and the same gauze made to cover the whole foot, which is then enveloped in sterilized cotton-wool. Any blisters-which are found to contain dark blood-stained fluid-should be snipped open and carefully dried and dressed.

Every effort should be made to keep the parts dry and sterile. If gangrene occurs the surgeon should on no account hasten too greatly to amputate, as the tissues adjoining the line of demarcation become more and more healthy and the line of granulation tissue between the dead and living tissues, if kept aseptic gives rise to little discharge and can be kept aseptic by daily dressines. Ultimately, when and how to noneare

should be decided by the surgeon.

## SWEATING OF THE FEET AND AXILLAR

Excessive perspiration of the feet and the skin of the axillae is a most annoying condition, and one that frequently is difficult to control satisfactorily. Besides keeping the parts properly bathed and cool, attention should be given to the clothing and shoes. Rubber soled shoes are objectionable, especially if there is excessive sweating of the feet. Air-tight dress shields should likewise be eliminated.

Various remedies have been suggested. Most recent and quite efficient is the preparation suggested by Stilmans. He finds a 25 per cent solution of aluminum chloride in distilled water, dabbed gently on the part every second or third day and allowed to dry, will cause a rapid amelioration of the excessive sweating. Three applications are usually sufficient.

If the condition recurs, the treatment may be repeated. Old fashioned remedies include bathing in weak vinegar (1 to 5), 2 per cent alum solution or very hot water.

Another preparation is the application of a 2 per cent mixture of the official solution of formaldehyde in water to the axillae, and up to a 5 per cent solution to the feet.

Pure glycerin rubbed on the feet will at times stop offensive sweating. Potassium permanganate solutions of about 5:1,000 have been found efficient as a wash for the feet.

Tannic acid may be used as follows:

							3m. or	(
Ŗ.	Tannic	acid	١	 			5	
	Alcohol.						1001	
М.	Water .			 	t	p to	200	
Too		1-			4			

Various drying powders have also been suggested for this condition, as:

	Purified talc
M.	
	Gm. or Co
R	Salicylic acid
	Bismuth subnitrate 40
M.	Zinc stearate

P. Posis said

			Gm. or C
B.	Salicylic	acid	. 2
		subnitrate	
М.	Starch .		. 20

In severe cases, treatment with the roentgen ray will control the condition. This treatment, in unskilled hands, is not altogether safe.

The use of the solutions of aluminum chloride or formaldehyde may, in some cases, cause a mild dermatitis, perhaps with itching. This may be ameliorated with protection of the parts against scratching, and the application of ointments, such as ointment of rose water containing 12 per cent boric acid, or a calamine lotion. If there is much itching, 0.5 per cent phenol may be incorporated in the calamine lotion.

### BURNS

It is customary, following Hebra, to classify burns by three degrees. This, classification is based on the extent of the pathologic change, varying from simple inflammatory reactions of the skin to a primary necrosis. In a review of the management of burns Ravogli concluded that the best treatment is that which favors sloughing of the burned skin, maintains sterility of the resulting wound and promotes granulation and the forming of new epidermis.

In burns of the first degree Ravogli believes that the application of a dry powder, such as talcum, bismuth or exsiccated alum, is the best treatment. Salves and baths are inadvisable because of the possibility of excoriation and maceration of the epidermis, with secondary infection. When there is severe pain a compress moistened with a 2 to 5 per cent solution of aluminum subacetate is applied to relieve the pain. Solution of aluminum subacetate (Burow's solution), 1:15 parts of water, is used. As soon as the pain is relieved, the skin should be dried and a powder applied.

In second degree burns, as soon as the blisters are distanced with serum they should be evacuated, leaving the epidermis in place to protect the papillary layer. Compresses of aluminum subacetate are again advisable. The application of compresses moistened with 1 per cent transtrophenol solution has been advised, and also a solution of potassium permanganate of 1:3,000 or 1:4,000. These solutions are difficult to administer and stain everything with which they come in contact.

Over the compresses moist with aluminum subacetate a piece of oiled silk, cut to hold the dressing in place, is bound. This may be removed at intervals and the dressings again moistened. Such oily substances as lime liniment, linseed oil or solution of calcium hydroxide may carry infection and should therefore be avoided. When the shreds of epidermis forming the blisters are easily detached they are removed with forceps and scissors and the whole surface is gradually cleaned. The burned areas may then be exposed to the air, for an hour at first, later for two or three hours. The surface is then covered with powder and sterile gauze. Points that ooze and granulate are touched with

3 per cent silver nitrate solution and are covered with 2 per cent boric acid in petrolatum to prevent crusting. Under such treatment these burns heal in ten days to two weeks.

## TANNIC ACID TREATMENT OF BURNS

Since Davidson in 1925 introduced tannic acid as a therapeutic measure in the treatment of burns, it has been generally accepted as the best method of treating the wound if the patient is seen within the first forty-

eight or seventy-two hours after the injury.

Following the infliction of a burn, the patient's general condition should receive first attention. If the patient is in shock, measures to relieve pain, restore external heat and supply fluid should be instituted immediately. If no shock is present or after the patient has responded to treatment, the wound should receive attention. Clothing and débris of various kinds should be carefully removed and loose pieces of tissue carefully lifted off. The surface should then be sprayed with tannic acid solution, which should be freshly prepared. Davidson used a 2.5 per cent aqueous solution, but most surgeons now believe that a 5 per cent aqueous soution is the most satisfactory. Modification of the solution so that it is neutral or slightly alkaline has certain advantages. Twenty-five grams of tannic acid and 4 Gm. of sodium carbonate added to 500 cc. of water will give a neutral 5 per cent solution. The spraying should be done every fifteen minutes until a firm mahogany-brown membrane is formed. Usually this occurs in about twelve or eighteen hours. If wet dressings are used they should be saturated at regular intervals with tannic acid solution, and a small window can be cut through the dressing to determine whether or not tanning has taken place. When tanning is completed, the dressing can be removed. In very extensive burns the patient may be immersed in a tub containing tannic acid solution. When this method of treatment is used the clothing can be removed after immersion and the solution should be changed as often as necessary to keep it clean. After the area is thoroughly tanned, no dressing is necessary over the burned area. The margins of the wound should be carefully watched and any blebs that form should be opened 652 BURNS

and painted with an antiseptic solution. A warm air blower should be used over the entire area at four hour intervals for several days after tanning in order to keep the crust thoroughly dry. It is not necessary to use a blower if the patient is kept under an electric light cradle and the temperature of the air under the cradle is maintained at about 100 F. If after four or five days symptoms of infection appear, the tanned membrane should be carefully inspected and any fluctuant or soft areas should be incised. If infection is present, wet dressings of 5 per cent sodium bicarbonate should be applied over the crust after removal of all the loose membrane over the infected areas. dressings facilitate removal of the crust. If no infection is present, the crust can be allowed to remain until it gradually curls off the healing surface.

This method has the advantage of relieving pain and preventing loss of fluid from the body. The crust acts as an impervious membrane, which prevents contamination of the wound and facilitates the easy handling of patients. Tissues that are destroyed by heat are fixed in the tanning process and in this way rendered

inert.

Donald R. Wells (J. A. M. A., Oct. 7, 1933, p. 1136) suggests immersing an extensively burned patient immediately in a tub filled with warm tannic acid solution. He is not particular about the precise percentage of the solution but uses enough tannic acid powder to give it a good muddy color. The temperature of the water is regulated solely by the comfort of the patient. Fresh water is run in and the solution drained out continuously and more tannic acid is added from time to time. The solution penetrates, softens, loosens and elevates the destroyed tissue.

The patient is transferred from the tub to a warm roon, placed on a dry bed and, from this time on, is kept absolutely dry with a continuous draft of warm air from one or more large commercial hair driers. For about seventy-two hours after the patient has been removed from the tub, the burned areas are more or least continuity sprayed with a 5 per cent solution of tamic acid but immediately and thoroughly dried with the blower.

In burns of large areas of the surface of the body, other methods of treatment are often necessary.

Kuss and others have advocated covering the burned region with caoutchouc paper in which holes are cut. Through these the serum drains and the wound is moistened at intervals with salt solution.

Parker (J. A. M. A., July 3, 1915, p. 16), after sloughing of the tissue has taken place, covers the wounds or ulcers, especially in burns of the extremi-

ties, with strips of adhesive plaster.

After separation of the slough, ribbons of adhesive plaster, from 1 to 11/4 inches wide and long enough to cover the area and lap over slightly, are placed over all the unhealed parts. The function of the plaster is to keep in the serum and prevent cells dying from dryness. Over this are placed several layers of gauze to absorb the secretion that works out between the strips of plaster.

The gauze is changed daily, and every few days the adhesive plaster is renewed. This is done by cutting through it with blunt scissors, when it immediately falls away from the moist surface to which it has not become attached. Pus sloughs with it. The surface is sponged and a new dressing applied. Parker finds that burned areas so treated granulate smoothly, with little absorption of toxic products, and that little pain is caused in changing dressings. Skin grafts placed under such dressings seem to grow as well or better than under gauze dressings. Silverfoil dressings are often very successful.

## PARAFFIN TREATMENT

Paraffin treatment has received considerable trial owing to its extensive use in the war zone. It is chiefly applicable to first and second degree burns. The lesions are carefully washed with some antiseptic preparation such as hypochlorite or chloramine solutions. These are dried by blotting with gauze or with a jet of hot air. Then paraffin-one of the paraffins for film preparations mentioned in New and Nonofficial Remedies-is melted and cooled to about 48 C. to 50 C. It is then sprayed on the wound by a special atomizer or painted on with a fine brush. If there is much pain, the wound may first be covered with sterile liquid petrolatum. The first layer of paraffin is covered with a very thin layer of cotton and the whole held in place by a bandage. Subsequently the dressings are removed, the lesions cleaned in the same manner and again dressed. Sloughs and dead tissue are removed as found at the daily dressings.

## GENTIAN VIOLET TREATMENT

J. H. Connell et al. (J. A. M. A., April 22, 1933, p. 1219) have treated burns with a 1 per cent aqueous solution of gentian violet as suggested by Aldrich (New England J. Med., Peb. 9, 1933, p. 259). However, they have made an attempt to improve on his technic. They incorporated the dye into a jelly-like base by adding 30 Gm. of tragacanth to 1,000 ec. of a 1 per cent aqueous solution of gentian violet. A thick layer of this jelly was placed on four or five sheets of gauze and the dressing applied to the burned area. In no case treated in this way did the fever rise to over 99.8 F., nor was any evidence of toxemia present. The end results of the treatment were satisfactory.

## ALKALI BURNS

Burns from sodium hydroxide are resistant to treatment for two reasons: (1) the combination between tissue and caustic does not "specific lattices to the its action continues, penetrating deeper than the usual neutralizing agents employed; (2) the formed serves as a foreign body hampering healing until it is removed, which removal is often difficultion is made more difficult owing to the neglect resulting from the relative painlessness and absence of edema.

The following is a method of treatment that has been successfully utilized:

All fresh alkali burns should be immediately washed in water.

With a gauze sponge or brush, one should rub off all disintegrating tissue, using a saturated solution of sodium borate.

On successive days the foregoing is repeated, so that no eschar forms. This permits the entrance of neutralizing agents.

From the outset wet dressings of saturated sodium borate solutions are applied.

After the alkali is fully removed, which may require two or three days' treatment of the character suggested treatment continues as for any other burn.

Reexposure during the period of treatment should be avoided

For the prevention of these alkali burns, the follow-

ing procedure may prove helpful: Whenever practicable, exposed workmen should wear

rubber gloves that fit snugly around the arm and without leaks Workmen with broken skins, such as in cuts, abra-

sions and chaps, should not do work involving exposure to sodium hydroxide.

Showers should be provided if the exposure entails extensive burns; if not, running water or hand basins should be readily accessible for frequent laving of the exposed parts in the event of known exposure.

The routine application of bland ointments, night and morning, to the hands and forearms of all workers will lessen the number of hurns

## LIME BURNS

The practical prevention of lime burns is fraught with difficulties. Long armed rubber gauntlets may be obtained, but if they are made of heavy durable rubber the weight is such as to cause discomfort; if of thin rubber, their lifetime is too short to be acceptable. Fabric gauntlets may be made alkali proof and are reasonably practical for the work mentioned.

This hazard of lime burns is common to all tanneries. In some lime-using processes, workmen as a routine smear their hands and arms with a mixture of equal parts of fish oil and pine tar. Fish oil has long been used in this combination, largely on account of its availability, since fish oil is used in tanneries for leather stuffing. The combination indicated hangs tenaciously to the skin and does not readily saponify on contact with lime solutions.

It has been observed that the greater number of lime burns are created under two conditions; (1) at the time of making up new solutions, lime powders or concentrated solutions reach the skin; and (2) breaks in the skin are exposed to lime solutions.

#### GENERAL TREATMENT

John J. Moorhead (J. A. M. A., April 4, 1931, p. 1191) advocates the treatment of burns by wet dressings of sodium bicarbonate during the early or dermattiis stage. As yet he has not been converted to trinitrophenol or tannic acid. For the secretory and granulation stage he prefers the open air, sunlight or electric light treatment, especially in children. At night or in the interval between seances of open exposure, he uses a dressing of equal parts of camphor limiment and olive oil, or boric ointment. He especially guards against contractures by enforced posture and exercises. He uses debridement only in selected cases, notably in localized third degree burns.

Over large, severely burned areas, Reverdin skin

grafts may aid epidermization.

An extensive burn practically always is accompanied by some systemic reaction. Patients may be stimulated with caffeine or strychnine, and morphine may be given to relieve the pain.

Gastroduodenal ulceration, with nausea, vomiting, and acute nephritis are not unusual sequelae. In such instances alkalization of the patient and digitalis will aid in clearing up the condition.

As the patient improves, a good diet, an abundance of open air and the administration of iron aid in improving the general condition.

### PLANT POISONING

## Primrose

Primrose poisoning is not infrequent, though generally perhaps it is unrecognized, the condition being called acute eczema.

Sharpe believes that the dermatitis not infrequently seen on the hands of milkers may sometimes be due to the fact that the poisonous substance of the wild primrose is carried on the udders of the cows.

It has been noted that primrose plants do not become readily infected with insects. Montgomery believes that the cause of this immunity may be the poison exuded by the plants.

The hands and arms are the parts most attacked by the primrose, and the symptoms are burning, puffing and at times small pin point blisters. There is also a

The primary treatment is to recognize and remove the cause. Magnesium sulphate solutions are generally satisfactory in relieving the inflammation. As is true of all acute skin eruptions, catharsis and a milk and cereal diet will hasten the recovery.

# Ivy, Oak and Sumach

Adelung (Arch. Int. Med., February 1913, p. 148) found that the poisonous juices of these plants are chemically identical, and that this poison is nonvolatile. It has been shown that as little as 0.001 mg, may produce a dermatitis.

It is now known that the poison of the ivy is of a resinous nature. As it is generally agreed by analysts that the poison is nonvolatile, the assertion that certain susceptible persons may be poisoned by simply passing by the plants remains to be explained. It is certain that neither the pollen nor the plant hairs are toxic, so that direct transmission is the only plausible explanation. Adelung also found that the poison was purely a local one. It is not distributed by the blood.

The latent period or length of time from the contact to the development of the dermatitis is shorter on the parts of the body where the skin is the thinnest, such as the face and the inner sides of the arms and wrists. As is well known, there is a varying susceptibility of individuals, though there seems to be no natural immunity (as shown experimentally). It is a popular idea, however, and seems to be a fact, that some persons may handle the poison ivy, for instance, with impunity. On the other hand, susceptible persons seem to vary as to their susceptibility in different seasons or in different years. This may be entirely due to the variability of the irritant poison.

Adelung found that the rhus plant would yield a pure toxin of about a thousandth of its weight. He believes that this toxin has a selective action for the epithelia cells. Experimentally Adelung could not demonstrate that immune bodies were formed in the blood or that there were any immune bodies contained in the blood of an individual who was more or less immune to the poison. Toyama (J. Cutan Dis., 1918, p. 157) found the poisonous ingredient to be a substance which he calls "urushiol," which may be isolated from the plants.

#### TREATMENT

If, immediately after exposure to the poison, the parts supposed to be affected are washed with soap and hot water, dermatitis generally will not occur. If it is known that just one small part of the body, as one part of the hand or finger, has touched the poison, the full strength tincture of iodine applied to the part will destroy the poison, according to Adelung.

Protection against poisoning is more or less furnished by oils or fats, as cuttonseed oil, smeared over the exposed parts of the body. Any one who is susceptible to such poisoning and knows that he has been exposed, should use soap and water locally and take a general hot bath. He should be sure also that the possibly infected outer clothing is not again worn until

thoroughly brushed and aired.

A strong solution of magnesium sulphate is perhaps one of the best local applications for the dermatits, when it develops. It relieves the itching and limits the inflammation. As soon as the acute inflammation has subsided, any simple talcum powder, or powdered

corn starch, is soothing to the skin.

Paul D. Lamson (J. A. M. A., Aug. 30, 1930, p. 663) finds that benzoly peroxide, a nonirritating, sightly antiseptic, definitely analgesic, nondeliquescent powder, having active oxidizing properties, is theoretically an almost ideal dusting powder for poison ivy intoxication. This powder has been shown in a small group of cases to reduce itching, to stop the spread of the intoxication and possibly to shorten its duration.

### CHLOASMA

The mechanism regulating pigment formation in the skin is entirely unknown. That there is such a mechanism is indicated by the disturbances of pigmentation which appear without any demonstrable cause, and which occur in association with pregnancy, with diseases of the suprarenal glands, and occasionally with various tumors in the abdomen and pelvis. These cases of chloasma associated with pelvic and abdominal conditions are vaguely explained as being due to dis-

turbances of the abdominal sympathetic nervous system. They are undoubtedly due to disturbances of some mechanism in the abdomen and pelvis, but that it is the sympathetic nervous system is in large part a surmise. A disturbance of the function of the suprarenal glands is probable.

In the face of so obscure an etiology, there is no rational method of systemic treatment. The most that can be done is to make an effort to overcome such uterine and other pelvic or abdominal sources of irritation as may be manifest. But such systemic treatment directed to the relief of chloasma is usually futile However, the administration of suprarenal gland substance by mouth will frequently, after a few weeks of treatment, cause pigmentations due to suprarenal insufficiency to disappear.

There remain local methods of therapy, and the best that such treatment can do is to get rid of the pigment temporarily. The increased pigment in these patches is situated in the lower part of the epidermis, and this pigment can be removed by the use of applications which cause deep exfoliation of the epidermis. This escharotic treatment is best referred to the skin specialist.

# ACLITE INTOXICATIONS

Drug Addictions, 660-Lead Poisoning, 668-Delirium Tremens, 677-Methyl (Wood) Alcohol Poisoning 683-Nitrobenzene Poisoning 685-Illuminating Gas Poisoning, 685-Trinitrotoluene Poisoning, 691-Mercuric Chloride Poisoning, 694 -Heat Prostration and Sunstroke, 698-Asphyxia, 702

#### DRUG ADDICTIONS

The Harrison antinarcotic law, which became effective March 1, 1915, deprived many addicts of their drugs. Numerous methods have been devised to wear patients from the drug habit. A complete discussion of the national and local narcotic laws is given in an article, entitled "The Indispensable Uses of Narcotics, by William C. Woodward (J. A. M. A., May 23, 1931, p. 1771, and reprinted also in a book of the same title).

C. Simon (J. A. M. A., March 1, 1924, p. 675), commissioner in charge of the narcotic division, New York City, says that only 2 per cent of the thousands of cases of narcotic addiction that were observed by the police were caused by physical or medical treatment. He says that the amounts of habit-forming drugs purchased or ordered by physicians and druggists is an infinitesimal proportion of what goes through underground channels.

It should be recognized by every one that not all addicts belong to the criminal classes, although when any one of them is deprived of his drug, he may go to any extreme to obtain it or to obtain money to buy it.

Drug addiction is often hard to diagnose or to discover. Even the friends of the addict and his immediate family may not know that he is using a drug. He conceals his method of administration, and learns to be very careful about the time of day in which he takes it. The periods in which it is more readily discovered that a person is an addict are when he is in serious need of the drug and very soon after he has taken it. In the first instance he is overexcited, nervous, irritable and abnormal, and in the second instance he may go to sleep at unusual hours and times.

### OBJECTS OF TREATMENT

- 1. To stop the drug.
- 2. To prevent pain and cause sleep.
- 3. To increase all secretions.
- 4. To sustain the strength.
- 5. To support the heart.
- 6. To teach self-control.
- 7. To promote nutrition and general health.

These are the primary objectives that one must keep in mind, and they also represent some of the difficulties

in the cure of the morphine habit.

Arthur B. Light (f. A. M. A., March 7, 1931, p. 823) believes that addicts will and can control to a large degree the intensity of their withdrawal symptoms. This factor, together with the largely negative results obtained in his studies of the withdrawal symptoms, led him to conclude that problems are frequently complicated by hysteria and that further studies should be combined with psychiatric and psychologic investigations.

The treatment of a person addicted to the use of opium or morphine should not be attempted unless the physician is certain that the patient is absolutely under his care and that his directions will be carried out in the minutest detail. With a reliable nurse, treatment may be attempted in a patient's home, but it is not often advisable. If a patient is to be treated at home, the physician should remember that the patient may become delirious, not only from the withdrawal of the morphine, but from any one of the atropine treatments. He might injure himself, or might jump out of a window in order to escape and obtain, if possible, what he thinks he needs. Also, the convalescence of these patients, like hysteria, is better controlled in an institution. In fact, generally better results are obtained in an institution for the treatment of this habit, or in a public or private hospital. The physician should exercise the greatest patience, and should show that he has sympathy for the patient during his mental and physical trial. At the same time the physician should be firm in carrying out the details of the treatment. He should also in every way encourage the patient to exercise his own will power in controlling the symptoms, and later in refraining from the use of the drug.

### THE LAMBERT-TOWNE METHOD

The Lambert (sometimes referred to as the Lambert-Towne) method of elimination and rapid withdrawal has proved quite satisfactory. While not strictly a cure for drug habits, it is intended to obliterate the terrible craving which these patients suffer when deprived of their accustomed drug. Vigorous elimination is the most important feature of the method, and is secured by the administration of compound cathartic pills and mass of mercury or some other form of mercury. The other essential measure is the persistent use of the following belladona mixture:

-	Gn Gn	ı. or Cc
13.	Tincturae belladonnae (15 per cent) Fluidextracti xanthoxyli	60
	Fluidextracti kantnoxyli	
	rididextracti nyoscyamiaa	30

The person addicted to the use of morphine is given 5 compound cathartic pills and 5 grains (0.32 Gm.) of mass of mercury. If these have not acted in six hours, he is given a saline cathartic. After three or four free movements, he is then given in three divided doses at half-hour intervals, two thirds or three fourths of his total twenty-four hour morphine or opium dose. The drug is given in the way he usually takes it. After the second dose, Lambert cautions the physician to study the patient carefully, as a few patients cannot comfortably take more than this amount, and should not receive the third dose of morphine. Beginning at the same time that the first dose of morphine is given, 6 drops, from a medicine dropper, of the belladonna xanthoxylum and hyoscyamus mixture are given, and this dose is repeated every hour for six hours. At the end of six hours the dose is increased by 2 drops. This belladonna mixture is then continued every hour, day and night, continuously throughout the treatment, the dosage being increased 2 drops every six hours until

the dose has reached 16 drops; this 16 drop dosage is then continued. The belladonna drops are diminished. or discontinued, at any time that the patient shows symptoms of belladonna poisoning, which is evidenced by dilated pupils, flushed face, dry throat, or a "peculiar incisive and insistent voice and an insistence on one or two ideas." If the belladonna treatment has been stopped, it is again begun at a reduced dosage as soon as these symptoms have subsided. If there is idiosyncrasy against belladonna, it will be shown in the first six or eight hours, and the dose must then be diminished. If 16 drops, the full dose, given for twelve consecutive hours does not cause dryness of the throat. the dose should be increased to 18, and to 20 drops an hour, and when the throat is dry, the dose should he reduced

Ten hours after the first dose of morphine, the patient is again given 5 compound cathartic pills and 5 grains of mass of mercury. If they do not act in eight hours, a saline cathartic should be given. When the bowels have acted thoroughly, one half of the dose of morphine given at first should be administered. belladonna drops are still being continued. Ten hours after the second dose of morphine has been given, that is, about the twenty-eighth hour of the treatment. 5 more compound cathartic pills are given and 5 grains of mass of mercury, followed again by a saline cathartic if the bowels do not act in eight hours. After the bowels have thoroughly acted from the last dose of cathartics, the third dose of morphine is administered, which should be one sixth of the first dose. Usually this will be the last dose of morphine required.

Ten hours after the third dose of morphine, that is, at about the forty-sixth hour, 5 compound eathartic pills and 5 grains of mass of mercury are again given, followed by a saline cathartic if needed. At this time, if not before, a bilious green stool should appear. When this appears, usually about eighteen hours after the third dose of morphine or about the fifty-sixth hour of treatment, 2 ounces (60 cc.) of castor oil is given to clean out the intestine. Sometimes, Lambert states, it is necessary to continue the belladona mixture over one or two more cathartic periods before giving the oil.

During the last bowel-moving period the patients are the most uncomfortable, and their excessive nervousness and discomfort may be controlled by codeine. This can be given hypodermically in 5 grain doses and repeated, if necessary, or some other sedative drug, not an oniate may be utilized.

At about the thirtieth hour of treatment, the patient should be stimulated with strychnine or digitalis, or both, every four to six hours. The amount of strychnine is not mentioned; neither is the amount nor the preparation of digitalis. Digitalis should rarely be given at four hour intervals. This cardiac stimulation is left entirely to the judgment of the physician who is

caring for the patient.

Some patients cannot tolerate the codeine, as it causes poisoning, and urticarial rash. Such patients may receive ethylmorophine hydrochloride, and Lambert believes that the latter is twice as strong in its activity as codeine, and that the dose should be "2 or 3 grains, or less." The dosage of this drug, according to New and Nonofficial Remedies, is one-fourth to one grain. The codeine or dionin, whichever is given, should be stopped as soon as possible after the castor oil has acted, although it may be given during the succeeding twenty-four hours if necessary. It should not be continued more than forty-eight hours, as the patient will acquire this habit, or return to the morphine habit.

Joint and other pains, and bone and muscle aches, Lambert says, "can sometimes be relieved by hypodermics of some form of ergot and strychnine, sometimes by massage, by sodium salicylate, sometimes by a salicylic compound combined with some of the coal tar products, such as antipyrine or acetphenetidin; and they can always be eased by codeine or dionin. The addition of codeine to these coal tar products of course increases their analgesic effect. It would therefore seem almost inexcusable, if morphine is being withdrawn, to continue codeine or ethylmorphine hydrochloride for more than one or two doses. The choice of these drugs is apparently left to the physician in charge of the patient. It would seem that the more drugs, the worse for the patient. All coal tar products are depressant and are dangerous for a heart, especially after it has been through the trials that it must go through in the

two or three days of this treatment.

Insomnia, Lambert says, may be treated with bromides, with chloral hydrate or with some other hypnotic. Veronal, he says, has caused much depression.
Any of these hypnotics must cause some depression.
He declares that as soon as the patient is up and about
muscular fatigue caused by regular exercise makes him
sleep, and usually such exercise can be taken at the end
of a sweek.

#### CRITICISM

The drugs used in this treatment might be severely criticized. There seems to be no necessity for both hyoscyamus and belladonna. The xanthoxylum is useless. It is probable that any good purgative could replace the obsolete compound cathartic pills.

## THE METHOD OF SCELETH

The patient is given a preparatory dose of a saline cathartic. The basis of the medical treatment is the following:

Scopolamine hydrobromide	gr. 1100
Pilocarpine hydrobromate	gr. 1/12
Ethylmorphine hydrochloride (dionin)	gr. ss
Fluidextract cascara sagrada	m xv
Alcohol	m xxx
Water ne ad	3 ;

Patients treated by this method are first given a saline cathartic, and then the mixture of scopolamine, pilocarpine, ethylmorphine hydrochloride and cascara sagrada in the combination described. The dose varies according to the amount of morphine the patient is taking. When more than 10 grains (0.65 Gm.) of morphine a day is being taken, Sceleth gives 60 minims (3.8 cc.) every three hours, day and night, for six days. On the seventh day the dose is reduced to 30 minims (1.9 cc.); on the eighth day to 15 minims (0.92 cc.), and on the ninth day 15 minims (0.92 cc.) three times a day, instead of every three hours day and night. On the tenth day this treatment is stopped, and strychnine nitrate, \( \frac{1}{30} \) grain (2 mg.) three times a day, is substituted. On the eleventh day the strychnine is reduced to 1/60 grain (1 mg.) three times a day, and this is continued for a week. During the first five

days Sceleth gives a very light diet, but liquids in

plenty.

Patients who are taking less than 10 grains (0.65 Gm.) of morphine a day start with a dose of 30 minims (1.9 cc.) of the mixture; and if less than 5 grains (0.32 Gm.), 15 minims (0.92 cc.).

This treatment represents the substitution of ethylmorphine hydrochloride for morphine: the fighting of the morphine depression by scopolamine; the necessary proniotion of secretions by pilocarpine, and the necessary laxative treatment by cascara. In other words, this is apparently the simplest and most rational treat-

During the first three days of the treatment the patients, of course, are sleepless, and they may vomit: but these symptoms occur with any treatment. If the pulse goes below 40 or above 120 per minute, the scopolamine mixture is stopped. If there are any signs of collapse, 1/2 grain (0.032 Gm.) of ethylmorphine hydrochloride, or 1/4 grain (16 mg.) of morphine, is given hypodermically. The same is true of any treatment; if collapse is in evidence, morphine must almost invariably be given.

Sceleth says that in only about four per cent of the cases is there scopolamine delirium. When such a condition occurs the scopolamine may be omitted from the mixture for a few times and then added in small doses. He further adds very laudably that no other drugs should be used during the treatment. By the fifth day the patient generally has no further desire for his morphine and is ready for food. He may have a ravenous appetite and will gain weight rapidly.

Sceleth concludes that if the cause that developed the morphine habit is still present, these patients are likely to have a relapse; if the cause that developed the habit has been removed, the patients are generally permanently cured. Consequently, if the condition that developed the habit has not been removed it is a subject for the most careful therapeutic and, if necessary, surgical consideration. There certainly is little use in putting a patient through the serious ordeal for the cure of the morphine habit if severe pain is sure to occur again.

The physician is urged to study the action of the drugs employed in the treatment of the morphine habit. It is recommended that he first try the Sceleth method, which would seem to be the least dangerous and for cause the least hardship, and which probably has as good a percentage of cures as any other treatment.

#### CRITICISM

Seeleh combines the laxative cascara sagrada with his scopolamine, pilocarpine and ethylmorphine hydrochloride treatment. Pilocarpine is an antagonist to scopolamine, as it promotes all secretions, especially the secretion of the saliva, of the bronchial mucous membrane, and of the sweat. It also acts against the atropine series in causing contraction of the pupils. Unlike the atropines, it is never a stimulant, but always a depressant, and the secondary effect is that of prostration

Ethylmorphine hydrochloride (dionin) is the hydrochloride of ethyl ester of morphine, that is, a morphine derivative. The action is much like that of morphine, with a possibility that its secondary effects are more depressant. Secleth in his treatment also uses

strychnine.

### CONCLUSION

These treatments are both atropine treatments, with free purging, and the more or less gradual withdrawal of the drug, with a subsequent building up of the general system and a development in the patient of selfcontrol

The drugs used in these systems of treatment are not here criticized from an unfiriendly standpoint, but to stimulate, if possible, a more careful study of the condition of morphinism in institutions that do not blindly follow one orthodox method. There is no halo, no zodiacal sign, and there is no none prayer that necessarily accompanies these particular combinations of drugs. Whatever efficacy they may have is largely due to the forcefulness of the men who carry out the treatment and to their persistence in obtaining the object aimed at through some antagonistic drugs, profuse purging, and support of the patient through his trial.

The final results are, of course, dependent on the cause of the addiction. If, since the beginning of the habit, the cause has been removed, the patients are permanently cured and do not return to the habit.

When the cause persists, whether it be a functional neurosis, a degenerate mentality or criminality, the patient occasionally returns to be treated anew. No matter what form of treatment is ultimately selected—whether slow or rapid withdrawal—individualization of the patient is of great importance. The assistance of a psychiatrist may be valuable. Above all, institutional treatment should be recommended over attempts at home care.

### LEAD POISONING

There are more than a hundred occupations in which industrial lead poisoning may occur. Mild poisoning is difficult to diagnose, and a man may suffer from mild chronic lead poisoning, show no symptoms himself, and vet cause his wife to abort or to give birth to a poorly

developed child.

In communities in which there are industrial plants handling lead, poisoning from this source is frequent. It has been shown that the most poisonous or the most soluble forms of lead are not necessarily the most likely to cause accidental poisoning. Those that most readily form dust seem to be most harmful. The more the dust is abolished, therefore, in all forms of lead factories and lead industries, the less poisoning. There is no question, of course, of the danger of fumes from molten lead.

In an investigation of this subject Dr. Alice Hamilton concluded that the most poisonous of the lead salts is the suboxide which forms on the surface of melted lead, is given off in fumes at high temperatures and rubs off on the hands of the workers. This salt causes poisoning in smelters, molders, type-setters, plumbers and others. The other forms most likely to cause poisoning are litharge or oxide of lead, and then the higher oxides of lead, as red lead, and the carbonate of lead, or white lead. Those who clean or scrape off lead paint, and also painters, are likely to have poisoning from white lead. Lead poisoning occurs frequently in factories in which men work in white lead, and in oxide of lead or red lead. Dr. Hamilton finds that those who work in red lead are poisoned sooner than those who work in white lead.

Dr. Hamilton (J. A. M. A., Aug. 23, 1924, p. 583) has carefully investigated the subject of industrial lead poisoning, and finds that in the mines of this country poisoning is due to the oxidized ore. Zinc smelting: roasting lead in the air to form oxides; the production of white lead (an industry very carefully protected in this country by means of preventing dust); and making storage batteries, are, she says, among the many occupations which cause more or less chronic lead poisoning. Enameling bathtubs, sinks and other plumbing goods (which is one of the chief uses of lead oxides, especially red lead); glazing and decorating pottery; manufacturing rubber goods (in the process of vulcanization); painting (where lead paints are still used, especially in sandpapering lead painted surfaces, which has been prohibited in some countries); brass polishing; the glass industry, and the printing trade are still other occupations which she lists as subjecting the workers to the ravages of chronic lead poisoning. Mixers and grinders in the glass industry are also in danger of lead poisoning, as well as workers in some forms of the brass industry, as brass polishers. Dr. Hamilton believes that "brass founder's ague" is generally due to lead or to lead and zinc mixed. In the printer's trade the absorption of lead is so infinitesimal that poisoning may not develop for years. She finds boys occupied in the dusty and more dangerous jobs in some of these industries, especially in sweeping floors. Girls and women are employed in many of these industries, and the worst lead work that they do is in the potteries and tile works, where they act as dippers' helpers and sweep the dipping rooms. The United States Public Health Service has shown that "the average period of exposure of men who developed lead poisoning was seventeen years, but of the women, 9.3 years, although their working day is shorter."

She believes, and it is now generally agreed, that a weak sulphuric acid lemonade, which workmen were urged to drink, is not a sure protective against lead poisoning. It has been proved that most forms of lead will be so acted on by the gastric juice during digestion that some lead will be absorbed. The only harmless lead seems to be the sulphide of lead.

Aub and others (J. A. M. A., Aug. 23, 1924, p. 588) have investigated the absorption and excretion of lead, and conclude that it is more rapidly absorbed through

the respiratory tract than through the gastro-intestinal tract. It is carried in the blood stream as the phosphate and is stored in the calcareous portion of the bones. Harm is done only while the lead is in the blood stream, whether directly after absorption or after release from the bones. In acute plumbism they find that lead is distributed more widely throughout the body than in the chronic, inactive form of poisoning. Acids or alkalis when administered, "particularly when associated with a low calcium intake, accelerate the release of lead and its excretion. A positive calcium balance in the body favors retention of lead in the bones."

The amount of lead necessary to cause poisoning varies greatly, probably according to idiosyncrasysome persons being susceptible, others being tolerant. Some artisans, therefore, may work in lead for years without evidence of poisoning, while others can work only a few weeks before poisoning is apparent. Investigations in some of our factories, Dr. Hamilton says, showed that from 25 to 35 per cent of the employees had some form of lead poisoning, Negroes seem more susceptible to lead than white men. and women are probably more susceptible than men. Fatigue, improper housing and insufficient food all render the individual more susceptible to lead poisoning and its anemia, as one would logically conclude. Those who drink much alcohol are more susceptible to the poisoning. The tendency to drink beer or whisky in order to remove the sickish, disagreeable, sweet taste from the mouth, due to the lead salts that are inhaled or swallowed, is great with men in these employments. Women, on the other hand, drink a good deal of tea, or crave sour things, to overcome this disagreeable taste.

The diagnosis of chronic lead poisoning is sometimes difficult. For that reason every one should be questioned as to his possible exposure to lead, after other more tangible causes are excluded, whether he loses appetite, is pale or anemic, is constipated or suffers from indigestion. These are all prodromal symptoms. The blue line on the gums may or may not be present. If the teeth and mouth are properly cared for the blue line is probably not often found. "The basonhitic granulation of the red cells," which was thought at one time to be diagnostic of chronic lead poisoning, has been shown not to be pathognomonic. Aub and others (J. Exper. Med., August 1924, pp. 151, 173 and 189) described the effect of lead on red blood cells as causing a shrinkage and increased brittleness. They assert that the cells become inelastic and cannot expand normally. They believe that the chemical reaction that causes this condition in lead poisoning is a precipitation of insoluble lead phosphate and the formation of acid. This inelastic and stiffened cell cannot withstand the trauma of normal circulation of the blood, which they think explains the marked destruction of peripheral blood in lead poisoning. Although lead is usually to be found in the urine of patients who show other signs of lead poisoning, its absence will not exclude lead poisoning. The laboratory test is difficult and the specimens should be submitted to experienced laboratory workers for report as to lead content. Kehoe and others (J. A. M. A., Dec. 18, 1926, p. 2081) studied 65 apparently normal healthy workmen chosen at random and found that they were secreting lead in the feces, or in the urine, or in both, but that there were no symptoms of poisoning. They insist that this demonstrates that there are many exposures to lead which may cause absorption of appreciable quantities. They say that "there is no diagnostic value in qualitative lead determinations in the excreta of persons suspected of having lead poisoning," and that there is no exact amount excreted which is significant of impending or present lead poisoning. It has been suggested, in cases in which the patient is working in lead and poisoning is suspected, that a soluble sulphide be rubbed on the skin, on the basis of the theory that lead is excreted through the skin, and that if a black precipitate is formed it will show that there is lead in the tissues.

Aub, Fairhall, Minot and Reznikoff (Medicine, February-May, 1925, p. 1) report their observations on lead poisoning. After absorption of lead from the gastro-intestinal tract, the liver is found to contain considerable lead. When lead enters the circulation in some other manner than through the alimentary tract, only a small portion of the lead is found in the liver. When lead is for a time confusually absorbed, it deposits in

the bones, where it seems to be harmless unless it again gets into the circulation. When symptoms of lead poisoning occur, they would advise administering calcium to aid in the storage of lead. Later, the calcium intake might be decreased to assist in the gradual permanent elimination of the lead. There is always danger from the effect of lead on the kidneys if they are injured, and when lead is being excreted it will constantly be found in the urine. Lead found in the fees may not come from the tissues of the body; it may simply pass through the intestinal cand.

Dr. Hamilton concludes that although one attack of acute plumbism is not serious and may not leave a pathologic condition, one attack does predispose to another. She believes that a man who has had one attack of acute colic, for instance, or of wrist-drop, should be ordered to stop working in lead, and that the employer should retuse him employement. The later pathologic manifestations of chronic lead poisoning become those of cardiovascular-rend disease on the one hand, or progressive anemia, weakened muscles (especially the extensors), tremor and emaciation.

In this anemia nucleated red corpuscles are almost

aways tound, even it the alterian is not protoured.
Walter Bauer and his associates (1, A, M, A, April 11, 1931, p. 1216) report that in 24 cases of lead colic the slow administration of 20 cc. of a sterile solution of 5 per cent calcium chloride relieved the pain immediately, frequently before the injection was completed. The action of the calcium chloride in this condition was far superior to any other medication they had ever employed.

Lead colic may occur suddenly, or after protracted constipation, with or without gastro-intestinal pains. During the paroxysm the patient generally vomits, the pulse is slowed and the blood pressure is generally raised. Nothing will stop this kind of pain but large doses of morphine, used in combination with atropine. As has been suggested by the Harvard investigators (Aub et al.), if the conditions are acute, calcium should be freely given to aid in the retention of lead in the body in a harmless form, at least for the immediate time of the acute symptoms. Certainly, when there is any acute condition iodide in any form should not be

given, and when it is deemed wise to begin giving an todice very small doses should be used. Hot fomentations to the abdomen are advisable or, better, if the patient is able, a hot bath should be taken. As soon as the pain is less sewere the patient should receive a saline cathartic, and best perhaps potassium and sodium tarrtrate (Rochelle salt). In spite of the unusual innocuousness of magnesium sulphate, it should not be forgotten that, occasionally, if magnesium sulphate does not cause purging and is absorbed, it can cause nervous depression not dissimilar to that which may occur from lead.

The after-treatment of lead poisoning of this nature, or if chronic lead poisoning is diagnosed without lead colic occurring, is a daily morning dose of potassium and sodium tartrate or something similar and the administration of small doses of sodium locitide. The dose of iodide should, as a rule, be small, not more than 0.20 Gm. (3 grains) three times a day, after meals. Large doses may cause more lead in the system to become soluble than is desired, and more acute symptoms of lead poisoning to occur. Anything that builds up the nutrition is also good after-treatment for chronic lead poisoning. For example, the administration of small doses of iron is valuable, as are measures to prevent high blood pressure and a possible beginning cardiovascular-renal disease.

If lead palsy, which in its most frequent form is wrist-drop, is present, the tonic treatment mentioned before should be carried out with the addition of strychnine and the use of electricity and massage.

Acute cerebral symptoms not infrequently occur. These symptoms may be delirium, epleptiform convulsions, or more or less coma. Occasionally hallucinations and insanity are caused by the action of lead on the brain. These conditions are all exceedingly serious. While wrist-drop is generally curable, more profound paralysis of the arms and legs is much more serious. C. V. Weller (Ann. Clin. Med., March 1925, p. 605) has studied the subject of lead meningo-enceptalopathy and believes that this term is more appropriate than the older name of meningitis saturnina. He believes that this condition of the brain due to lead poisoning occurs more frequently in children and in young persons, and

that it is more likely to occur after a short period of exposure to heavy doses of lead than after more chronic poisoning. However, workers in lead who have had several attacks of lead colic and even lead palsy may, after many years, develop convulsions. It would seem that these symptoms of lead poisoning result from the chronic effects of lead, as arteriosclerosis and chronic nephritis. Weller has found that children may have lead convulsions after sucking or gnawing painted surfaces.

He describes the following types of cerebral lead poisoning. In the meningeal type there is marked headache, mostly occipital and extending down the neck, Colic is often present, vomiting may occur, the pulse is slow, the temperature is only slightly elevated, if above normal, and there is more or less muscular rigidity. The eye symptoms may include absence of or a very sluggish pupillary light reflex, strabismus, ptosis of one or both lids, and amaurosis which may be permanent, Facial palsy and Cheyne-Stokes breathing may occur. There are exaggerated tendon reflexes, ankle clonus and sensory disturbances, if there is much spinal meningeal involvement. Weller notes that lumbar puncture during this period "shows a clear sterile fluid under somewhat increased pressure. Its cells are usually moderately increased in number and may reach 300 or more per cubic millimeter. They are usually chiefly lymphocytes, but in a considerable number of cases polymorphonuclears have been present to the extent of more than 60 per cent. Globulin is increased, and there is some evidence to show that sugar is increased also." Convulsions may occur, and also delirium, especially at night. There may be increasing somnolence, and finally coma. The patient may recover without these serious symptoms developing, or the condition may cause death.

The second or convulsive type is the most common. A convulsion may be the first manifestation of the serious poisoning. There may be convulsive movements of different parts of the body without epileptiform attacks, but usually the convulsion is epileptiform. In this type the convulsions may be frequently repeated, and the patients die of exhaustion within a few days. Even

after one convulsion there may be dementia.

In the third type there is delirium, which may be either a mild or an active mania with hallucinations of all kinds.

In the fourth type coma may occur without any premonitory symptoms, or it may follow delirium and convulsions. The patient may lie for a long period in a state of lethargy from which he cannot be aroused.

Besides differentiating the condition from various infections, it must be especially distinguished, at least the convulsive and coma types, from uremic conditions. The blood should always be tested for syphilis. Weller particularly warns against liberating the lead stored in the organs and bones by the administration of iodides

in this condition of encephalopathy.

Lead poisoning in its various types may occur in young children, from I to 3 years of age, who have a craving for something, which seems to be satisfied by putting all sorts of things in their mouths, or by eating dirt, chewing their playthings, or licking paint. From painted things they may acquire lead poisoning. Children with unusual symptoms, especially unexplained coiles, unexplained paralysis, and unexplained convolusions, should be studied for lead poisoning by examining the urine, feeces and blood.

C. F. McKhann and E. C. Vogt (J. A. M. A., Oct. 7, 1933, p. 1131) report that a diagnosis of plumbism in children can be made in the early stages of intoxication by the correlation of the history, physical signs and laboratory data in conjunction with the roentgenologic findings. Cerebral manifestations seldom occur in patients who receive at this stage of the disease, treatment directed toward hastening the deposition of lead in the bones. To this end calcium salts or phosphates are administered to diminish the solubility of lead in the blood and viosterol is given to hasten the errowth of hom.

The treatment of patients with lead encephalitis remains in an unsatisfactory state. The attack on lead poisoning in children must be made largely through

prophylactic measures.

In acute lead poisoning the stomach should be washed out and magnesium sulphate should be given and repeated. Other treatment will be indicated by the conditions present. Prevention, of course, should be considered by every employer, and should be understood by every employee, who has anything to do with industries that make or handle lead. A patient who has once been poisoned by lead should either leave his occupation or should inaugurate such means of prevention of future poisoning as are efficient.

### TETRA-ETHYL LEAD

The importance of poisoning by tetra-ethyl lead has been made manifest by the serious poisoning of workers with tetra-ethyl gasoline. There seems to be no question that acute cerebral poisoning can occur in landlers of and workers in tetra-ethyl lead. Also it emerges to be a considerable to the control of the control of

F. B. Flinn (J. Indust. Hyg., February 1926, p. 51) of Columbia University believes that the lead from the fumes of tetra-ethyl lead and ethyl gasoline may be absorbed through the sound skin as well as inhaled. He also believes that a storage of lead can take place from

this kind of exposure.

Hamilton, Reznikoff and Burnham (J. A. M. A., May 16, 1925, p. 1481) declare that the highly poisonous properties of this salt have long been known. They add that it can be absorbed from the skin and the respiratory tract, and that there is a cumulative effect when repeated small doses are absorbed. As in other lead poisoning, in acute experimental poisoning of animals with tetra-ethyl lead, lead has been found in most of the tissues of the body and it is stored in the bores as are other lead salts. An early symptom of workers in this form of lead is insomnia. Other symptoms are headache, abnormal temperature, slowed pulse, all forms of indigestion, abdominal cramps, dizziness and loss of weight. Less frequent manifestations are tremors and skin irritations.

Special attention was called to this poisonous substance because it is added to gasoline to increase its efficiency in operating motor engines. Many workers and employees of the gasoline refineries have been poisoned, and it is a risk for any garage to have this gasoline used on its premises. The United States Bureau of Mines investigated the menace of tetra-

ethyl lead in gasoline and minimized its toxicity. Scemingly such a report was not warranted. A special advisory committee appointed by the Surgeon-General of the United States (I. A. M. A., Jan. 30, 1926, p. 370) also seems to have given a clean bill of health to the use of tetra-ethyl lead in gasoline for motor fuel, "provided that its distribution and use are controlled by proper revulations."

Tetra-ethyl lead is a clear olly liquid, has a sweet odor, and is volatile at ordinary temperatures. When its vapor is inhaled it causes poisoning; it may also be absorbed from the skin and cause poisoning; an acute poisoning the meningeal symptoms are quite severe, and the patient is practically insane. Chronic symptoms of poisoning are not dissimilar to those of other forms of lead. In acute poisoning acidosis seems to be present, and alkaline treatment is indicated. R. A. Kehoe (J. A. M. A., July 1, 1925, p. 108) insists that for the insomnia and cerebral excitement of patients acutely poisoned with tetra-ethyl lead, it is an exceedingly dangerous practice to administer opium compounds or chloral hydrate.

## DELIRIUM TREMENS

In individuals who have habitually used considerable quantities of alcoholic stimulants, though they may rarely, perhaps never, drink to intoxication, the unfavorable effects of the chronic indulgence in alcohol are frequently seen when acute or chronic illness supervenes. Especially in the severe acute infections, such as pneumonia, the symptoms are frequently modified or added to by the effects of the habitual use of alcohol. Alcoholism may imitate many disturbances of the nervous system and it may require the highest acumen of the physician to make a correct diagnosis.

A common characteristic of these cases is the loss of appetite, accompanied often by nausea and vomiting, so that it is difficult for the patient to retain either nourishment or medicine. If the stomach is irritable, it is necessary to give such gastric seataives as bismuth or sodium bicarbonate with such aromatics as capsicum or peppermint. The stomach being in a condition to retain food, abundance of light nourishment should be administered at resular intervals.

#### SEDATIVES

At the first appearance of restlessness and insomnia the patient should be given sodium bromide in 1 Gm. (15 grain) doses, repeated every two, three or four hours. In the evening, when it is natural to desire that the patient should sleep, a more active hypnotic should be used. Chloral hydrate in a dose of 1 Gm. (15 grains), and repeated in one hour, if needed, will generally prove effective in securing prolonged sleep. After this rest the patient's condition will frequently be found very much improved.

Although chloral hydrate is undoubtedly the peer of all hypnotic drugs, it is rated as a cardiac and circulatory depressant, and, as is well known, can cause heart failure and death. All hypnotics except morphine, however, in sufficient doses to produce sleep, are cardiac depressants. It is quite probable that a dose of chloral which is sufficient to produce sleep in a patient with delirium tremens is no more depressant than the dose of other hypnotics sufficient to produce sleep in a patient in the same condition. If the circulation is notably weak, however, other hypnotics may be selected. Paraldehyde has had a long period of approval. Its action is rapid, and many times satisfactory. If the dose is sufficient, there may be considerable circulatory depression for a short time. The various synthetic hypnotics, old and new, sulphonmethane (sulphonal), sulphonethylmethane (trional), barbital (diethyl barbituric acid or veronal), and soluble barbital (sodium diethyl-barbiturate, veronal-sodium). all act more or less satisfactorily. However, these drugs act much more slowly than do chloral hydrate or paraldehyde and, in doses that are sufficient, will produce considerable later depression. A dose of scopolamine hydrobromide, hypodermically sufficient to cause sleep in this excited condition, is likely to cause depression. Also, there often is an increased susceptibility to any atropine or atropine-containing drug, so that the cerebral excitement may be increased by scopolamine.

In cases of acute illness in which, on account of the history of alcoholic addiction, there is reason to believe that symptoms referable to the habitual use of alcohol are liable to-supervene, the use of sedatives should be commenced early, before any of the characteristic

symptoms of alcoholism appear. These sedatives should be continued until it is evident that there is no danger

of prolonged insomnia and restlessness.

In severe cases in which active delirium with hallucinations has supervened, energetic treatment is demanded. Danger must be looked for in two or three directions. The circulation is threatened, owing to the weak action of the heart, which may result in edema of the lungs. At the same time the circulation in the brain is especially affected so that there is a passive congestion, with some edema. Added to this are the symptoms of exhaustion due to the insomnia and violent muscular agitation. Here there is urgent need of maintaining the nutrition of the patient by giving liquid nourishment at regular intervals. It is necessary also to watch the circulation carefully and to maintain the action of the heart. The use of alcoholic stimulants for this purpose, while still recommended by many, is of doubtful propriety at this stage of the disease.

If there is serious cerebral excitement and hypnotics in ordinary doses do not act, a good treatment is ergot, in some reliable aseptic form, injected intramuscularly into the deltoid muscle, 1 cc. at a dose. One hour after this injection, a hypodermic injection of morphine may be given, not more than ½ grain (16 mg.)

Theoretically morphine is not good treatment when there is cerebral excitement. The dose required to quiet such excitement is very large, while smaller doses tend to increase the excitement. Under the condition described, however, ergot given first to relieve congestion of the brain and spinal cord and followed by morphine prevents the initial excitement of the morphine and projects the length of time during which a given dose of morphine will act, and the outcome is satisfactory.

# LUMBAR PUNCTURE

The belief is becoming somewhat general that one of the important factors in delirium is increased pressure in the cerebrospinal fluid and that lumbar puncture will relieve this. Schottmüller and Schumm found a marked elevation in the pressure of this fluid in 80 per cent of the cases of acute alcoholism examined by

them. In one instance they drew as much as 100 cc without an unfavorable reaction. Steinebach found a similar condition in 75 per cent of patients with alcoholic delirium, and in the remainder there was a relative increase in the pressure of the fluid. That this increased pressure may be responsible for the delirium, and is not merely a condition which accompanies chronic alcoholism, is indicated by the fact that increased pressure is not found in alcoholic addicts before or after an attack of delirium tremens. Nor do habitual drinkers who are not suffering from acute alcoholism or who have not had delirium show an increased pressure. Further, if delirium tremens is due to increased pressure, the lowering of the tension by lumbar puncture should cause an improvement in the patient's condition. In this regard Steinebach's results are to the point. In every case the delirium grew milder frequently it ended entirely. The disorientation as to time and place usually remained for a while. In 2 instances the delirium returned. Following a second puncture, an increase in the pressure was again found and the delirium soon abated. In the total series of 18 cases, the average duration of muscular unrest following lumbar puncture was from three to four hours. and of delirium twenty-four hours. In 33 cases in which lumbar puncture was not done, the average of the restless days was four, and of the delirium, five Thus, through lumbar puncture the duration of delirium was shortened 60 per cent and the restlessness 75 per cent. In this series of cases puncture was done during the first twenty-four hours of delirium. Of the cases in which puncture was done on the second day following the onset of the delirium, improvement occurred less rapidly. Here the average duration of restlessness was from six to seven hours, of mental confusion twenty-four hours, and of delirium, eighty

The manner of action of lumbar puncture in delirium tremens has been thought to be the same as that described by Quincke for puncture in acute serous meningitis. If the intraventricular pressure reaches a certain point, the usual channels of escape for the spinal fluid become occluded. Then, by lumbar puncture, the hypertension is released and healing begins.

Certain facts, however, make another explanation necessary. First, lumbar puncture works equally well in cases which show only a relative increase in pressure; second, Steinebach found that after the withdrawal of the spinal fluid in these cases, the reinjection of from 15 to 20 cc. of physiologic sodium chloride solution gave even more beneficial results. These facts indicate that there is probably some toxic irritant present in the spinal fluid. If this view is accepted, the best treatment of delirium tremens is a spinal puncture which releases the pressure and removes part of the toxic substance and a dilution of what remains by the injection of salt solution.

# CEREBRAL EDEMA

If there are signs of cerebral edema, no treatment is better than, or so satisfactory as, the subcutaneous ergot therapy. The ergot may be repeated in three hours, and then once in six hours for several doses, if it is required. The administration of ergot by mouth for the action desired on the brain is absolutely unsatisfactory and cannot be relied on. If the heart is weak ergot is the drug indicated.

In other words, if there is apparent edema of the brain, ergot; if there is cerebral excitement and the heart is efficient, chloral hydrate; if there is cerebral excitement and the chloral hydrate is unsatisfactory alone, add ergot; if there is cerebral excitement and the

heart is weak, ergot and morphine.

Strychnine is inadvisable as a stimulant in this condition. A saturated solution of camphor in an aseptic oil may be given hypodermically, if required, as a quickly acting stimulant. Strophanthine hypodermically may be given, if deemed advisable. Digitalis, which does not act well for at least twenty hours, is generally not indicated.

In the meantime, while these various dietetic and medicinal measures are being employed, the patient should be kept quiet, should be constantly watched, and should be frequently bathed with warm water, or,

if strong enough, given hot baths.

### HOGAN'S TREATMENT

Hogan (J. A. M. A., Dec. 16, 1916, p. 1826) describes the treatment used by him in cases of severe

alcoholic delirium. In all of these he observed a severe acid intoxication. The effect of the toxins on the neryous system and liver may show anything from simple edema to severe degenerative changes of the fatty type. Any treatment to be of service must be used in the stages of edema. After experimenting with various salts capable of dehydrating edematous tissues, he has devised a mixture of sodium bromide, sodium chloride and sodium bicarbonate which can be used in large quantities intravenously, without producing the toxic effect of bromide as ordinarily given in large doses. As in the severe types of case there is also a starvation acidosis, dextrose in highest concentration is also used intravenously. This not only furnishes an available carbohydrate, readily utilized by the body, but in 30 per cent concentration produces marked dehydrating effects on the central nervous systems. Sixty-four patients were treated. The mortality was 9.3 per cent. and the average time of detention 2.63 days. The aftertreatment followed in all cases consisted of active elimination produced by 0.3 Gm, of calomel followed by 30 Gm. of magnesium sulphate. The diet followed the general hospital routine. In his private practice Hogan feeds the patient sugar in large quantities and furnishes alkali to keep down the acid intoxication. "In preparing the solutions 5.8 Gm, of chemically pure sodium chloride and 8.4 Gm. of chemically pure sodium bicarbonate are boiled in 120 cc. of distilled water and filtered through paper, then placed in a flask and reboiled. In addition 10.2 Gm. of chemically pure sodium bromide is boiled in 30 cc. distilled water. filtered and reboiled. These may be kept ready for use and, when needed, added to 850 cc. of either freshly distilled water or tap water that has been filtered and boiled. Under no circumstances should old distilled water be used, as I have found that it produces severe chills. This mixture is heated to about 110 F. and is ready for use. The glucose used in the early cases was the anhydrous variety, but on account of the price and our inability to procure it in sufficient quantity, I found that I could prepare the glucose crystals found in the market and the results were satisfactory. In a flask with 250 cc. distilled water 80 Gm, are placed and boiled. To this is added 0.25 Gm, of charcoal. This is allowed to stand for twenty-four hours, is then filtered into a clean flask, reboiled and is ready for use. This solution may be made and kept ready for use. Both of these solutions must be given very slowly, from twenty to thirty minutes being taken for the 1,250 cc. A small percolator, such as is used in giving salvarsan, with rubber tubing and needle attached, is all the appartus that is needed."

## METHYL (WOOD) ALCOHOL POISONING

The dangerous methyl or wood alcohol has long been used in the industries and has been a prolific cause of severe and frequently fatal types of poisoning.

### SYMPTOMS

Among the first symptoms to appear usually are nausea and weakness. There may be associated pain in the back, headache, severe thirst and difficult respiration. Another early symptom is the dimness of vision, which proceeds into the well known woodalcohol blindness. The patients appear cyanotic. The temperature is variable. There may be headache and vertigo, tinnitus aurium, and in severe cases delirium with hallucinations. Ophthalmoscopically, there is central scotoma with subsequent optic atrophy. Harrop and Benedict (J. A. M. A., Jan. 3, 1920, p. 25) did not find any disturbance of phenolsulphonphthalein excretion or of the normal blood urea concentration. They did, however, find acidosis of a severe grade to be a prominent factor in the symptomatology. The bicarbonate content of the blood plasma as determined by the Van Slyke method was as low as 36 per cent by volume equivalent to carbon dioxide.

The foremost reason for the unlike physiologic behavior of the two commonest alcohols lies in the great difference in the time of their oxidation in the body. Ethyl alcohol may be excreted to a small degree through the eliminatory organs, but for the most part it is burned up much as are the ordinary loodstuffs. Hence the contention that alcohol may be a food. Methyl alcohol, on the other hand, is oxidized with difficulty. More than half of a nontoxic dose may find its way out of the body again through the respiratory channels. Furthermore, the progress of the elimination of the property of the property of the summer or the progress of the elimination.

ination of the unoxidized portions is comparatively slow. As a result the output from a single dose may continue even during an entire week. As a consequence of these features—deficient oxidation and slow elimination—the poison delays in the organism unduly long to continue its detrimental effects.

The fact that a portion of the nervous system—the optic nerve—is especially affected by methyl alcohol naturally suggests that this substance has a preferential affinity for the nervous tissue. Researches of Pohl (Arch. F. exper. Path. u. Pharmadol., 1918, p. 204) at the Pharmacologic Institute of the University of Breslau indicate that this suspicion is not verified. It almost seems, says Pohl, as if no organ retains so little methyl alcohol as does the brain. It must therefore be assumed that the nervous system is peculiarly sensitive to the toxic agent rather than that it is unduly overwhelmed by larger quantities concentrating in this tiesure.

#### TREATMENT

The prospect of effective treatment in the case of an agent exhibiting this peculiar behavior is not particularly promising. Pohl found in the case of animals poisoned with wood alcohol that a combination of blood letting and injection of Ringer's solution seemed to decrease the concentration of the poison in vitally affected tissues.

On the basis of these studies and the laboratory observations in cases of wood alcohol poisoning, Harrop and Benedict mention as the two main features of the treatment gastric lavage during the first three days and correction of the acidosis by intravenous injection of sodium bicarbonate. From 400 cc. to 500 cc. of a 5 per cent solution of sodium bicarbonate may be given intravenously and repeated on succeeding days as the condition of the patient, indicated by the laboratory analyses, warrants. Since the methyl alcohol is excreted into the stomach for several days following the appearance of the first symptoms, repeated gastric lavage aids in removing some of the poison from the body. The patient should of course be given symptomatic treatment for the relief of pain and delirium and the eyes should have attention by a competent ophthalmologist.

### NITROBENZENE POISONING

Nitrobenzene, used in the dve industry, in shoe polish and in soaps, has also been employed for denaturing alcohol. Many cases have been reported in which persons who had recently worn freshly dyed shoes developed cyanosis, vertigo, headache and tinnitus. The chief symptoms as observed by Stifel, Scott and Hanzlik, and Sanders (J. A. M. A., Feb. 8, 1919, p. 395: April 10, 1920, p. 1000: May 29, 1920, p. 1518) were caused by the methemoglobinemia. This is manifested by a gravish-blue evanotic color of the skin and visible mucous membranes. These symptoms are often accompanied by nausea, vomiting, great muscular weakness, marked dyspnea, delirium and convulsive movements. Total unconsciousness and coma may supervene followed by death from respiratory paralysis. The condition is not usually fatal. In about 36 cases recently reported there was only 1 death, that of a man who drank shoe polish, as reported by Donovan (J. A. M. A., June 12, 1920, p. 1647). The treatment should be symptomatic and supportive.

H. M. Cole (J. A. M. A., Feb. 5, 1927, p. 397) lists some of the frequent causes of injuries and poisonings as follows: dyed furs, hair dyes, dyed clothing, cosmetics, from which he has 137 reports of injuries, hair tonics and shampoos, and a number of miscellaneous preparations. This shows the widespread use of harmtul articles and the danuer from dyed furs and clothing.

## ILLUMINATING GAS POISONING

Through the introduction of various forms of gas heaters and special illuminating devices illuminating gas poisoning is becoming more frequent. Suicide by this method is also increasing, because of its facility. The gas heating stove (without a flue) causes much of the accidental poisoning. Yandell Henderson (J. A. M. A., Sept. 6, 1924, p. 788) points out that in addition to the danger from the gas of burning coal and the gas escaping from leaks in gas pipes, the hazard of many occupations is carbon monoxide poisoning, owing to the danger from automobile exhaust gas, of which carbon monoxide is the chief toxic constituent. Carbon monoxide poisoning has become a menace that is hardly to be measured. He declares that each automobile dis-

charges an average of about 2 cubic feet per minute of this gas, and even a small automobile discharges 1 cubic foot a minute, enough to render a small closed garage deadly in five minutes. A man working in such garages, or repair shops, is almost daily subjected to partial intoxication from this gas. Poisoning is first noted by a paralysis of the legs, and if a person so overcome is soon discovered he may be dragged to the air and saved, but he cannot get to the open air himself.

A. M. Stevens (J. A. M. A., April 17, 1926, p. 1201) finds that the chief danger of carbon monoxide poisoning is from the escape of illuminating gas. The affinity of the hemoglobin of the blood for carbon monoxide has been found by investigators to be considerably more than two hundred twenty times as great as the affinity of hemoglobin for oxygen. Consequently, the red blood cells are rendered useless for oxygenation when carbon monoxide is inhaled. Stevens declares that there is a cumulative poisonous effect from repeated small amounts of absorbed carbon monoxide, and that "young children and infants are peculiarly susceptible to gradual carbon monoxide poisoning." He urges that clinicians be alert to recognize such cases of chronic poisoning.

Persons poisoned with illuminating gas should receive at once as much fresh air as possible; the tongue should be drawn forward, and if respiration is failing artificial respiration should be begun. The use of various devices has been advocated in such cases, and a report on them has been issued by a committee on resuscitation. In selecting such a device the possibilities of the machine for harm should be considered. The machine should be investigated as to its capabilities of producing suction, too great inflation, or other injury. Ordinarily the most simple devices or simple methods, like the Schäfer method. will serve. It has been pointed out that the devices are seldom regularly available, and that proper use requires the service of a trained technician. Saline solution should be administered subcutaneously every two hours in quantities of 1 pint; or, perhaps better, the saline solution should be given by the colon by the continuous method

For stimulation, hypodermic injections of strychnine or campbor in oil may be of value. Strophanthine may be administered, and strong coffee may be given by the mouth, if the patient is not totally unconscious. Physical ologic sodium chloride solutions may be injected into the rectum by the drip method, or from 300 to 500 cc. may be given every three hours subcutaneously under the breast. Other substances that can be used are hypodermic injections of 2 cc. of ether, 1200 grain (0.6 mg.) of atropine, or 2 miniums (0.12 cc.) of enipenptine solution (1:1,000). The body, especially the feet, should be kept warm.

Yandell Henderson (J. A. M. A., Aug. 19, 1916, p. 580) showed that the poisonous effect of the gas is entirely due to its avidity for hemoglobin, with which it forms the same kind of combination as does oxygen, but two hundred and fifty times as strong. Its poisonous effects seem to be wholly due to the resulting decrease in the oxygen-carrying power of the blood. It is a misapprehension, however, to suppose that the compound is permanent or induces any lasting deterioration of the oxygen-carrying power. The combination of the carbon monoxide immediately begins to break up when oxygen can be introduced or the sufferer is carried into the fresh air, if this is done within fifteen or twenty minutes or even half an hour. Very often, however, the victim never recovers consciousness and dies a day or two later. The use of bleeding and transfusion is seldom effective and the patient, if he recovers, does so in spite of them. Left to itself, nature does all as far as we now know to stop the sequels of the poison. Usually a man will die who has breathed 0.2 per cent of carbon monoxide in normal air for four or five hours. When from 2 to 5 per cent carbon monoxide has been inhaled, as in coal dust explosion, nearly all the hemoglobin is combined in the first few breaths drawn and death occurs almost as quickly as in drowning. About all that can be done in case of poisoning is to administer artificial respiration when normal respiration has failed, to administer oxygen for half an hour, to keep the patient warm if his temperature has fallen, to supply water to the system, preferably by rectal drip, and otherwise give him good nursing and such symptomatic treatment as seems advisable. Henderson adds to these rather negative suggestions one of an experimental character, based on the resemblance of the coma to that of diabetes, indicating an intense acidosis. Accordingly, in 2 cases he administered a 3 per cent solution of sodium bicarbonate intravenously, in 1 case the total of 2 quarts given at intervals during two hours, and in the other 4 quarts in six hours. His conclusions are as follows: "1. Carbon monoxide does not form a permanent compound with hemoglobin. Its toxic effects are wholly due to the inability of the blood combined with carbon monoxide to transport oxygen to the tissues. 2. In the presence of excess oxygen, or even of pure air, carbon monoxide is rapidly given off and the oxygen-carrying power of the hemoglobin is restored. 3. The continuance of coma, the subsequent tissue degeneration and death after several days, resulting from carbon monoxide poisoning, are not due to retention of the gas, but are the results of injury to the brain and other organs by the insufficiency of oxygen supplied to them by the blood while the patient was breathing the gas. 4. There is no reason to believe that either bleeding or transfusion of blood is beneficial. They are more likely to be harmful, 5. Fresh air-with oxygen inhalation for a short time as early as possiblesymptomatic treatment, and good nursing are the only measures to be recommended. Practically the die is already cast for death, permanent defects or complete recovery at the moment when the patient is brought out of the asphyxial atmosphere. 6. It is just possible, theoretically, that alkali therapy may be beneficial in combating the acidosis induced by asphyxia."

Henderson (J. A. M. A., Sept. 26, 1924, p. 758) is convinced that in all forms of asphyxia, whether from carbon monoxide, ether, or alcohol intoxication, or from sudden respiratory failure, the Schafer, prone method of artificial respiration is the best. Carbon dioxide is now known to be the best stimulant to respiration, and "oxygen deficiency, if at all intense, acts as a sort of whip, which excites respiration to activity, and even to excessive activity, which is followed by a subsequent period of depressed breathing. Pure oxygen, or air enriched with oxygen, is not a respiratory stimulant. When a man is exposed to a deficiency of oxygen for a time, his breathing is greatly

augmented and he exhales more carbon dioxide than the body can afford to lose from its store of carbonic acid and bicarbonates." If oxygen or air is given him, a marked decrease in respiration occurs and the breathing may stop. This condition of deficiency of carbon dioxide Henderson has long termed "acapnia." Except in drowning, deficiency in oxygen is almost invariably accompanied by deficiency in carbon dioxide. In this condition the blood alkali is lowered, and edema of the brain and congestion of the lungs may result. Only in pneumonia would oxygen alone be indicated for inhalation. He points out that under nearly all other conditions oxygen administered for purposes of resuscitation should contain also a sufficient amount of carbon dioxide to stimulate the breathing. Five per cent of carbon dioxide in from 90 to 95 per cent of oxygen is sufficient. The best method of giving this mixture for resuscitation is from a special type of inhaler, which he and Haggard have devised. If a person poisoned by carbon monoxide is revived in the air he will be nauseated, have headache, and be miserable perhaps for days. However, if he is given an inhalation treatment of this mixture, he rapidly eliminates the carbon monoxide and may soon return to work with absence of symptoms. Even if the person has been subjected for some time to the gas poisoning, treatment at a hospital with this inhalation seems to prevent long debility and nerve degenerations and pneumonia, which so frequently follow such poisoning.

C. K. Drinker (I. Indust. Hyg., December 1925, p. 539) has investigated the use of 5 per cent carbon dioxide and 95 per cent oxygen inhalations, associated in severe cases with artificial respiration in the prone position. He finds that such treatment of this poisoning, as reported by 180 organizations using this method.

is most efficient.

If the patient survives, the urine should be watched carefully for some time, in order that disturbances of the kidneys may be immediately noted.

Wilson and Winkleman (J. A. M. A., May 3, 1924, p. 1407) find that multiple neuritis is a not infrequent

sequel to carbon monoxide poisoning.

In all serious conditions of shock, coma and collapse, while everything that ought to be done should be done, there is a constant tendency to do too much, especially

with drugs hypodermically.

Philip Drinker and his associates (J. A. M. A., Oct. 25, 1930, p. 1249) used the respirator designed by him in the treatment of 17 patients with illuminating gas poisoning. Nine of the patients recovered.

Yandell Henderson (J. A. M. A., Jan. 18, 1930, p. 179) contends that education of the public regarding the hazard of carbon monoxide poisoning, in itself, is not sufficient to prevent numerous cases of asphyxiation. In addition, regulations and their effective enforcement are needed to remedy the common household conditions leading to asphyxiation. A few of

these hazards are badly designed stoves, flexible tubing, quarter gas meters, and lack of flues in water heaters. The increasing use of gas for heating homes may involve a large increase of statalities under sefficient inspection, supervision and control of household gas

appliances is established.

City gas of high caloric value contains much less carbon monoxide than gas of low caloric value. It is in the interest of public health and safety that the amount

of carbon monoxide in gas be reduced.

The hazard to life of automobile exhaust gas in private garages should be called to public attention by annually repeated warnings, just before cold weather begins. The danger to health in large garages and in repair shops should be controlled by sanitary regulations actively enforced.

In rescue and repair work Henderson notes that the hose mask is safe than the absorbent type of gas mask. Both these types are much safer than the self-contained oxygen apparatus. He advises discarding pulmotors, lung motors and other mechanical devices for artificial respiration and replacement by general training in the prone pressure method of artificial respiration.

Inhalation of oxygen and carbon dioxide induces a rapid elimination of carbon monoxide. In many other forms of gas poisoning as well, stimulation of breathing by this inhalation accelerates the elimination of the

toxic gas or vapor through the lungs.

The victims of carbon monoxide asphyxia should receive immediate artificial respiration by the prone pressure method if respiration has stopped. Unhalation

of a mixture of oxygen and from 5 to 7 per cent carbon dioxide should be administered. If this is not available, oxygen alone should be given and continued until the pulse and temperature are normal. Measures should be taken to keep the patient warm, and muscular exertion must be prevented.

On the basis of experimental work, M. M. Brooks (Proc. Soc. Exper. Biol. & Med., June 1932, p. 1228) recommended intravenous injections of 1 per cent aqueous solution of methylene blue autoclayed at 15 pounds' pressure for fifteen minutes in cases of carbon monoxide poisoning. In a number of cases in which injections of 50 cc. of this solution have been given recovery of the patients has been reported. Its use is still in the experimental stages and there is need for more accurate observation and more complete data. On the other hand, H. W. Haggard and L. A. Greenberg (J. A. M. A., June 24, 1933, p. 2001) maintain that there is no valid basis for the belief that methylene blue is an antidote for carbon monoxide asphyxia. The chief effect of the methylene blue is to convert some of the hemoglobin of the blood into methemoglobin. It thus diminishes the oxygen carrying capacity of the blood and acts as a synergist with carbon monoxide in promoting asphyxia. They believe that it probably also exerts other deleterious effects.

Chronic carbon monoxide poisoning is a not infrequent condition. Sometimes there are insomnia and palpitation; some of the reflexes are often disturbed, and the eyes may be affected. The circulation may be so depressed that there are tingling and numbness, although there may be paleness without anenia. As many of these symptoms may develop from other causes, an opportunity for the inhalation of this gas must be known to exist before the condition is diagnosed as chronic carbon monoxide poisoning. It should be remembered that such poisoning is a frequent cause of systemic disturbances, and should especially be suspected when young children are subjected to an atmostuter so contaminated.

### TRINITROTOLUENE POISONING

In ammunition factories, trinitrotoluene, one of the high explosives employed, has been found to be dangerous to the health of a minority of workers coming in contact with it, and has proved fatal from having induced toxic jaundice. The matter has become so important that the medical inspector of factories in Great Britain has prepared a paper on the chemistry of rimitrotolune (or T N T) for the benefit of practitioners. Herein are discussed its method of absorption, the symptoms produced, the precautions to be taken against poisoning and the method of treatment. The differential diagnosis of trinitrotolune poisoning from that of dinitrobenzene is outlined, as is tetryl and lyddite, the latter a trinitrosheenel derivations.

Trinitrotoluene is a high explosive obtained by nitrating toluene, from coal tar, a benzene compound in which one hydrogen atom is replaced by CH<sub>1</sub>. In this during the process of nitrating three other hydrogen atoms are replaced by the nitro radical NO<sub>2</sub>. The product is solid at ordinary temperatures and may be reduced to a fine powder; it melts at 80 C<sub>2</sub>, and sub-

limes when melted.

When the skin or hair comes in contact with trinitrotoluene, a characteristic yellow or tawny orange stain is produced. This stain is removable by oils, greases, acetone, ether, benzene and other compounds, but not by water. When trinitrotoluene is treated with an alcoholic solution of potassium hydroxide, a deep pink color, changing to purple and then to brown, is produced. This reaction is employed in testing for trinitrotoluene in urine, after the latter is treated to release the trinitrotoluene from its combinations—a rather combinated procedure.

Trinitrotoluene can be absorbed to a dangerous extent by the skin. As fine dust or as sublimate it will reach the mucous membranes of the nose and mouth, or perhaps even the lungs, and may be swallowed with the secretions of the mouth, nose and throat. It may be recovered from the feces unchanged in most workers, and in many from the urine, but only in combination. Among the symptoms it produces are dermatitis, much like that produced by other irritants, increased by flushing and perspiration and by friction. Other manifestations are gastritis, with abdominal pain, vomiting, constipation which is constant, flatulence and distention. Blood changes similar to those of dinitro-

benzene poisoning also occur, with the presence of methemoglobin, though cyanosis and breathlessness are less evident. Cell degeneration is readily produced by trinitrotoluene, and when the liver is involved toxic jaundice results, though in only a few cases. Evidence of gradual absorption is shown by pallor of the face and an ashen gray color of the lips. Sometimes the lips and tongue are deeply cyanosed. Jaundice may be conjunctival or general, and often appears suddenly during the first four weeks of exposure. Liver dulness is variable, ascites is sometimes present, and respiratory distress is not noticeable when the patient is in bed. Pyrexia has occasionally been observed in severe cases. but neither bradycardia nor pruritus is common. Two deaths from anemia unassociated with jaundice have been reported, with reduction of red cells to one million, These cells were of unequal size, but no poikilocytes or nucleated red cells were noted. Examination excluded pernicious anemia. Death resulted from hemolytic aplastic anemia, the blood-forming marrow having been greatly reduced.

Points of differential diagnosis are the characteristic appearance already described, the character and situation of the abdominal pain, and the presence of constipation and abdominal distention. The condition may be confused with other gastric disturbances, and must be distinguished from tertyl and trinitrophenol poisoning, the former staining the skin yellow or apricot, the latter a canary yellow or greenish yellow. Both set up a dermatitis similar to that of trinitrotoluene, but the constitutional symptoms are not pronounced, and toxic

jaundice from them has not been reported.

At postmortem examination the outstanding feature is atrophy of the liver, which in some instances is reduced to half the normal weight. Microscopically, the greater part of the liver tissue is found to have undergone complete destruction, associated with proliferation of fibrous tissue. The kidneys are large and icteric; the cortex bulges; the labyrinths are frequently yellow, and there is engorgement of the pyramids, and cloudy swelling and fatty degeneration of the tubules.

Treatment in the absence of jaundice is simple, and consists of removal from contact, rest in bed for a day or two, a diet consisting of milk, milk puddings, fruit and green vegetables, demuleent drinks, such as barley water, tea and coffee. As a routine measure for the constipation, vegetable laxatives are given with a mixture containing sodium sulphate, potassium citrate and sodium bicarbonate. In cases of jaundice, absolute rest in bed is essential and a milk diet, snall in quantity at first, but gradually increasing to 4 pints a day is given. The bowels must be kept loose, preferably by a mixture containing magnesium carbonate, magnesium sulphate and peppermint water, repeatedly given. In jaundice with marked toxic symptoms the prognosis is grave. Alkalis, such as the citrates and bicarbonates, should be administered to overcome the tendency to acid intoxication. Rectal and intravenous saline injections have a place in the treatment of severe cases.

### MERCURIC CHLORIDE POISONING

Most of the epidemic of mercurial poisoning dates back to a case which was riven considerable attention by the lay press. This not only advertised mercuric chloride as a method of poisering rut made the added unfortunate error of stating that d'ath by this method was painless and easy. Poisoning also occurs not infrequently following the use of mercurial valguial douches or injections; in some instances there has been a fatal result.

Sansum (J. A. M. A., March 23, 1918, p. 824) found that the minimum uniformly lethal intravenous dose of mercuric chloride in dogs was 4 mg, per kilogram of body weight. This dose corresponds approximately to the smallest de\*2 of mercuric chloride which has been known to cause death in man. Such a dose in dogs failed to praduce aurira, whereas this symptom was brought about by the injection of 5 mg, oer kilogram.

### SYMPTOMS

The first symptoms of mercuric chloride poisoning are epigastric pain, nausea and vomiting, the vomitus sometimes containing blood. The gastric symptoms may be almost entirely relieved by proper treatment. The success of this therapy depends on the length of time between the ingestion of the poison and the treatment, and on whether the st.mach was full or empty when the poison reached it. Diarrhea and signs of

duodenal inflammation occur within a few hours, unless the poison is quickly vomited. If much mercury has been absorbed, stomatitis occurs on the second day.

If a tangible amount of mercury has been absorbed. there is soon a gradual diminution in the amount of urine passed, and after the first or second day there may be complete suppression. As noted in other acute metallic poisonings, total suppression of urine may not cause convulsions, as it ordinarily does in uremia. The reason is that probably some of the detoxicating functions of the kidneys may still be operative. After several days delirium may occur, followed by comawhile the heart shows gradual failure.

If acute nephritis does not cause death, ulcerative colitis with hemorrhages from the bowels may prove

fatal, even after a lapse of several weeks.

### TREATMENT

The following treatment of mercuric chloride poisoning is founded on the therapeutic results and laboratory observations of Lambert and Patterson (Arch. Int. Med., November 1915, p. 865) and of Fantus (J. Lab. & Clin. Med., September 1916, p. 879; ibid., August 1917, p. 813). It is best immediately to examine the first material expelled from the stomach either by vomiting or by lavage, and to examine the urine for mercury. The patient may not have taken mercuric chloride as he imagines. The patient is first given the whites of several eggs and the stomach is then washed out. He is then given a pint of egg albumin water. and the stomach is again washed out.

According to Fantus, a tablet composed of sodium phosphite, 0.36 Gm., and sodium acetate, 0.24 Gm., should be dissolved and administered as soon as possible. If this drug cannot be obtained, the following solution should be substituted: sodium hypophosphite, 1 Gm.; hydrogen peroxide, 5 cc., and water, 10 cc. If the amount of poison swallowed is known, ten times that amount of hypophosphite should be given. As this dosage of hypophosphite might be large, it should immediately be followed by lavage with warm water and a greatly diluted solution of the antidote. This may be followed by a safe dose of the antidote, which may be repeated every eight hours for several days.

A glass of egg albumin water should also be given every alternate hour until several doses have been taken. Since it has been shown that milk is worthless as an antidote, there does not seem to be any necessity for using milk, which curdles and causes acid. As a demulcent, starch water, slippery ellm, or flaxsed tea may be given. A gram of sodium acetate, dissolved in sweetened water, should be taken every three hours for or a day or two, being omitted at such times as it comes in conflict with the antidote.

Lambert and Patterson's recommendation of rectal irrigation is important. They use the drop method of rectal irrigation, with a solution of potassium acetate, 4 Gm. (a drachm), to the pint. It might be well to substitute sodium acetate for the potassium acetate. In all poisoning and in all serious conditions sodium salts are safer than potassium salts, because solutions of the latter are more or less rapidly absorbed and generally cause diuresis. The colon should also be thoroughly irrigated twice daily to remove whatever mercury may have been deposited there or which may have reached the colon through the bowels. As there occurs a resecretion of mercury into the stomach, it should be washed out twice daily during the first few days unless the patient vomits repeatedly when given warm water. Lambert and Patterson affirm that it is advisable to continue the colonic drip enteroclysis day and night. at short intervals, even though it is intensely disagreeable to the patient until two examinations of the urine on successive days have given a negative test for mercury. They also assert that if excessive doses of mercuric chloride have been absorbed, or if the kidneys were previously diseased, the treatment should continue for a longer period, perhaps three weeks, if necessary.

If the kidneys have become seriously involved and suppression is present when a patient first comes under observation, the prognosis, although very serious, is not hopeless. Lambert and Patterson advise a daily sweat in a hot pack. This treatment, and also frequently repeated stomach washings, depend on the condition of the circulation—if the heart is weak and the circulation poor, the hot pack may be inadvisable.

Wilms and Holm have recommended calcium sulphide as an antidote, and Hall has suggested the use of potassium iodide and quinine hydrochloride. Weiss, basing his treatment on Fischer's hypothesis, has given the Fischer treatment and combined with it oral administration of "imperial drink" or other mixtures to keep the urine alkaline. MacNider found that the nephritis of mercuric chloride poisoning was constantly associated with and showed parallelism to the phenomena of acidosis and this he states is an indication for alkaline treatment.

Sansum found that in cases of anuria from experimental mercuric chloride poisoning, all attempts to reestablish the flow of urine by intravenous administration of strongly diuretic solutions failed. It is his belief that in the reported cured cases a fatal dose was not received because the early treatment prevented absorption of any considerable amount of mercury. The symptoms were those of a relatively mild grade of tissue poisoning, compatible with recovery without accelerated diuresis. "It would appear" he says, "as though the success of the treatment may have been due chiefly to the factors of delayed absorption and hastened elimination from the alimentary tract rather than the diuresis and sweating, although on the basis of the present experiments on dogs, no conclusion could he drawn as to the value of the sweating." In the same way he found that intravenous injections of sodium acetate or sodium phosphite solution failed to save the lives of dogs poisoned with intravenous injections of minimum uniformly lethal doses of mercuric chloride. He concludes finally:

"I. There is no sound experimental basis for the belief that the promotion of free diuresis contributes materially to the chances of recovery in mercuric chloride poisoning, and this phase of treatment should not be permitted to obscure that which is more essential. 2. Combined treatments which involve sweating diuresis and increased elimination from the bowel probably owe their value chiefly to the latter effort. 3. It would appear in the light of the present study that when 4 mg. or more of mercuric chloride per kilo gram of body weight has entered the tissues at large, death regularly occurs, and that we have no adequate grounds for believing that death is preventable by any known form of treatment. Whereas subsequent studies may add to our knowledge, it would appear that persons who have recovered from metcuric chloride poisoning owe their lives to the fact teletal does has never gained access to the extraportal circulation. Practical therapeutic efforts should be directed frankly toward the accomplishment of two things: (a) mechanical removal of the poison from the lumen of the alimentary tract; (b) antidoting the poison before it leaves the portal circuit, that is, particularly before absorption.

However, Sansum's results should not cause the physician confronted with one of these well nigh hopeless cases to relax his efforts. Everything possible should be done that seems scientifically practical to

relieve the various symptoms as they arise.

Howard E. Marchbanks and his associates (J. A. M. A., Feb. 21, 1931, p. 611) report a case of mercuric chloride poisoning treated by injection of 10 cc. of sodium thiosulphate solution given every eight hours. intravenously, until 50 cc. was administered. They conclude that the solution neutralized the mercury and

saved the patient's life.

S. M. Rosenthal (J. A. M. A., April 21, 1934, p. 1273) suggests the following procedure in the average adult case of acute mercury poisoning. Gastric lavage is done through a stomach tube with a 5 per cent solution of sodium formaldehyde sulphoxylate, approximately 200 cc. of this solution being left in the stomach. Immediately following this, 10 Gm. dissolved in from 100 to 200 cc. of distilled water is slowly injected intravenously, from twenty to thirty minutes being permitted for the injection. From four to six hours after the completion of this injection the intravenous injection of from 5 to 10 Gm. of sulphoxylate may be repeated in severe cases. This treatment was used in 10 cases of acute poisoning from corrosive mercuric chloride and recovery occurred without appreciable kidney damage in all cases.

# HEAT PROSTRATION AND SUNSTROKE

It is customary to divide the cases of illness due to excessive exposure to high temperature into two classes: one is distinguished as heat exhaustion; the other as sunstroke, or thermic or heat fever. It is important to recognize the distinction between these two classes of cases, as their treatment is entirely different.

Heat exhaustion is considered by many as a milder condition, although it frequently results in death. It may occur in those who er not exposed to the direct which is made to the constant of the constant of

### TREATMENT OF HEAT EXHAUSTION

The treatment of this condition embraces removal of the patient from the influence of the excessive heat to which he has been subjected. If he has been outdoors in the sun, he should be immediately removed to the shade, and as quickly as practicable be taken into a house or a hospital. He should be placed in bed in a room which is cool and well ventilated. The clothing should be loosened so as not to interfere with respiration or circulation. His working clothes should be removed, and hot applications should be placed around the extremities so as to restore the circulation and make him warm. If he is unconscious, so that he cannot swallow, inhalations of ammonia water should be given by the nostrils. A mustard paste should be applied to the back of the neck and over the spine. If the respiration is obviously impaired, a hypodermic injection of ½00 grain (0.6 mg.) of sulphate of atropine should be administered. If the heart is weak, a hypodermic injection of \$30 grain (2 mg.) of strychnine sulphate should be given. As soon as the patient is able to swallow, he may be given hot coffee and spirits of camphor, or a hypodermic of caffeine. If the circulation is improved, the body becomes warm, and the patient regains consciousness.

In the second class of eases which are termed sunstroke or heat fever, the patient will be found in an entirely different condition. Usually on the arrival of the physician the patient will be found to be exceedingly hot, with a dry skin, a congested face, swollen veins and throbbing arteries. The patient's temperature will usually be found elevated to from 105 to 110 Fz, or even higher. There is great restlessness and the breathing may be stertorous. The pulse is full and rapid, the pupils, dilated at first, may become contracted, and unconsciousness may rapidly supervene. These symptoms may have come on without very much premonitory warning. They require prompt and active treatment.

### TREATMENT OF SUNSTROKE

The patient must at once be removed to the shade. and as soon as practicable to a cool and well ventilated room. His clothing having been removed, and his temperature having been taken, he should, if practicable, be at once placed in a tub of water at a temperature of 80 F., to which ice should be gradually added. At the same time, ice should be applied to the head. While the patient is in the ice bath, he should be rubbed vigorously to promote the peripheral circulation and bring the hot blood to the surface of the body where it may be cooled. The temperature should be taken in the rectum every fifteen minutes. As soon as it has fallen to 102 the patient should be removed from the bath; otherwise the temperature may continue to fall until it becomes subnormal, and the patient may pass into a condition of collapse. Ordinarily this bath should not be continued longer than from twenty to forty minutes. However, it may be repeated after an interval of two, three or four hours, if the temperature should again become elevated In some of these cases in which it is obvious that a congestion of the internal viscera is embarrassing the action of the heart, venesection may be performed, and a pint of blood may be removed. This loss of liquid from the circulation may subsequently be restored by the injection of physiologic sodium chloride solution, if it is deemed advisable.

If there seems to be a tendency to edema and congestion of the lungs, a hypodermic injection of \$\frac{1}{100}\$ grain (0.6 mg.) of atropine sulphate should be administered.

If, after the temperature has commenced to fall, the pulse becomes weak, a hypodermic injection of ½30 grain (2 mg.) of strychnine sulphate may be adminis-

ered.

If the elevation of the temperature is not so great, or if the use of the bath is impracticable, the patient may be laid on a cot, over which a rubber blanket has been placed, and a sheet rung out of cold water may be wrapped about him. He may then be rubbed with ice. After the sheet has become warm it may be removed and another one which has been allowed to soak in cold water may be substituted for the first. It is often a good plan to give physiologic sodium chloride solution by the rectum.

#### AFTER-EFFECTS

Persons who have been the victims either of heat exhaustion or of heat fever often suffer more or less from the effects of excessive heat during the remainder of their lives. It is always wise to warn patients or their friends of this possibility, and to direct them to avoid, as far as possible, exposure to the direct rays of the sun or to overheated rooms during the summer. They should be advised to practice cold bathing and, if possible, sea bathing during the summer months. Persons who seem to be predisposed to being affected by the heat should avoid exposing themselves as much as possible. They should dress lightly and drink plenty of water, avoid indulgence in alcoholic drinks and should keep their heads as cool as possible. These precautions may wisely be observed by every one in hot weather, and especially when an excess of humidity in the atmosphere diminishes the perspiration of those who are working, or are exposed to very hot air.

Some patients who have suffered severe sunstroke find that their memory is greatly impaired afterward, and that they never have the same mental ability and memory. Little can be done to benefit this condition. If one feels that he should give the patients something in the hope that it may do some good, probably nothing will be more likely to prove beneficial than some form

of calcium

Not infrequently infants and young children suffer from the effects of extreme heat. This condition should be looked for in children who are suddenly taken ill in the hot weather without any apparent reason. If they are found suffering from a high temperature for which no other explanation can be found, and if the history of the case shows that they have been exposed to high temperature, they should be placed under favorable conditions in a cool, airy room, and given a sponge bath of cool water, and cold drinks should be administered. If the heart becomes weak, tea or coffee, well dilluted, may be given.

Sometimes after exposure to excessive heat there is twitching in the muscles, and even severe convulsions. When the convulsions occur and continue they may be controlled by a hypodermic injection of ½ grain (16 mg.) of morphine with ½ ng rain (0.4 mg.) of atropine. If they resist this treatment, the patient may be anesthetized by the administration of chloroform. Instead a rectal enema containing 2 Gm. (30 grains) of bromide of sodium and 1 Gm. (15 grains) of chloral hydrate may be administered and repeated, if necessary, after one hour. It may be of advantage to do a spinal concepture.

# ASPHYXIA

# ASPHYXIA FROM SUBMERSION: DROWNING

Most individuals who become asphyxiated from submersion in water or from drowning are dead when they are taken out of the water, and all efforts to restore them to life are futtle. This is especially the case if complete submersion has lasted four or five minutes. The occasional instance of the successful treatment of this form of asphyxia, however, makes it incumbent on the physician to be thoroughly informed as to the best methods to employ in the treatment of these cases, and to be prepared to carry them out, if he happens to be near when the patient is taken out of the water.

In the first place, the water must be expelled, so far as possible, from the respiratory passages. Probably there is no better way of doing this than by inverting the patient by taking hold of his feet and raising them up and letting his head hang down. This is a simple maneuver, provided the bystanders have strength enough to carry it out. Rolling the patient on a barrel is a crude and harsh substitute. Having removed the water as far as possible from the chest, the next thing to do is to perform artificial respiration. There are a number of methods of doing this, the best being that of Schäfer.

### THE SCHÄFER METHOD

The method presented by E. A. Schäfer, professor of physiology in the University of Edinburgh, is as follows: He recommends that the patient be placed in the prone position. The physician being astride the patient, the open hands are placed on either side of the lower ribs and firm, but not violent, pressure is exerted. This may be done by allowing the weight of the body to come on the arms. After this pressure has been exerted for three seconds the body may be brought upward and the pressure relaxed. This should be repeated at intervals of five seconds, or twelve times in a minute.

Schäfer made investigations with a view to comparing the utility of the various methods of artificial respiration. He found that in natural respiration the air exchanged in a minute by a person breathing thirteen times a minute was 5,850 cc. The amount of tidal air at each breath, therefore, would be 450 cc. When the Sylvester method is employed, the amount of air exchanged in a minute was 2,280 cc., showing the tidal air of each breath to be only 175 cc. With the Marshall Hall method the exchange of air was 3,300 cc., with a tidal air volume of 254 cc. With the Howard method the exchange per minute is 4,030 cc. and the tidal air volume 310 cc. With his own method he was able to pump 6,760 cc. through the lungs per minute, showing a tidal air volume of 520 cc. He therefore believes that this is the most efficient method of performing artificial respiration. He declares that the advantages are: "(1) It is fully efficient; (2) it can be performed without fatigue by a single individual; (3) it is simple and easily learned; (4) it allows the tongue to fall forward, and the mucus and water to escape from the mouth, so that the tendency of these to block the passage of air, which is inherent to the supine position, is altogether obviated." In treating these cases it is important to preserve as far as possible the warmth of the patient. Woolen blankets should be wrapped about him after the surface of the body has been thoroughly dried. While artificial respiration is being employed, friction of the surface of the body, especially from the extremities toward the center, should be carefully but not roughly done. It is recommended that artificial respiration should be continued from one to two hours. It seems, however, that there is very little use in continuing efforts to restore respiration after the action of the heart has ceased. As long as the action of the heart continues, the artificial respiration should be continued, regularly and systematically.

# DISEASES OF THE EYE

Ophthalmia Neonatorum, 705—Blepharitis, 707— Hordeolum (Stye), 709—Iritis, 709—Burns of the Eye from Lime, 712—Floating Spots—Muscae Volitantes, 712.

# OPHTHALMIA NEONATORUM

The prevention of ophthalmia neonatorum is of national importance and should be understood and carried out by every practitioner who takes charge of obstetric cases. The use of Credé's method has greatly reduced the frequency of this disease, and has proved that ophthalmia neonatorum is preventable.

# PROPHYLAXIS

The child's first bath is of the utmost importance. The eyelids must be gently wiped free from the mucus and other matter covering them. A piece of absorbent cotton dipped in boric acid solution will serve for this purpose. The head must then be cared for, a soft wash cloth wrung almost dry from warm water being employed. Water should not be poured over the head so that the secretion is washed into the eyes. When the general bath is given, the water that is used for the bath must not be used about the head. After the eyes have been thoroughly cleansed, a drop of a 1 per cent nitrate of silver solution should be instilled into each eve. While Credé advised the use of a 2 per cent solution, it is generally believed that the 1 per cent is of sufficient strength. This may be followed by a little physiologic sodium chloride solution or a drop of epinephrine chloride solution (1:5,000). This "stops the pain and neutralizes the further action of the silver." Other more modern silver preparations have also been advised, as 25 per cent mild silver protein or 10 per cent strong silver protein. They are probably not as reliable as the silver nitrate.

Special precautions should be taken to prevent infection of those attendant on the patient. In case one eve is infected the noninfected eye should be protected by a shield. Buller's shield is a watch glass held in place over the eye by the use of adhesive strips and a layer of collodion.

#### ACTIVE TREATMENT

If in spite of such prophylactic treatment the conjunctivae become inflamed, they should be thoroughly cleansed. The lid of the eye is gently raised, all pressure being avoided, and the tip of a soft rubber bulk syringe is inserted under the upper lid. Slowly and gently the eye is irrigated with a saturated ool doric acid solution to wash out all purulent matter. This should be done every fifteen minutes if the discharge is profuse, or less often if it is not copious. Mercuric choride (1: 10,000), physiologic sodium chloride solution, or sterile water may also be used as cleansing agents.

Consider a control of the control of

atropine are generally advised.

In the treatment of these cases silver nitrate is the drug of chief reliance. Once each day during the course, especially while there is a purulent discharge, a I or 2 per cent solution of silver nitrate should be brushed on the everted conjunctiva. If eversion of the lids is extremely painful, they may, at first, simply be raised and the silver nitrate solution applied with a

well protected swab.

The eye is cleaned as often as necessary to keep it reasonably free of pus, be it every twenty minutes or every three hours. The lids are wiped clean and then separated with the fingers. The conjunctival sac is washed out with boric acid squeezed from a pledget of cotton, and several drops of one of the milder silver salts are instilled. The excess is wiped away, and the lids are liberally smeared with some bland salve, such as boric acid ointment. Injury to the corneal epithelium is most carefully guarded against. In the later stage of the disease, if the conjunctiva becomes boggy and

little improvement is taking place, silver nitrate and zinc

sulphate are called into use.

Regarding the silver preparation to be used in the actue stages of the disease, a nonirritating drug is indicated. The stronger silver preparations, such as nitrate, do good in inflammations by their ability to set up a reaction and draw in protective substances from the neighboring tissue. Their place is therefore in those inflammations in which a sufficient reaction does not already exist. This is not the case in gonorrheal ophthalmia, since the reaction is often too great (especially in the adult form) to be taken care of by the conjunctival circulation.

A number of physicians have reported the successful use of mercurochrome-220 soluble (N. N. R.). A 2 per cent solution is freely instilled into the eye. It produces a slight burning effect for a few seconds. It also leaves a red stain, but it will not yield a permanent one such as is occasionally produced by such silver salts

as the mild and strong silver proteins.

If the discharge and inflammation persist, it may be necessary to consider surgical procedures or specific treatment of the complications. The disease is a serious one and the services of a specialist should be procured early in its course.

# BLEPHARITIS

Inflammation of the eyelids has been associated with numerous disturbances, chiefly a general debilitated condition of the body, following infectious diseases, lack of cleanliness and errors of refraction. Bad hygienic surroundings, lack of sleep, irritating atmosphere due to dust, heat, smoke, or other causes, and insufficient light also play a part in some cases.

The correction of these general causes is important, more important perhaps than any local treatment. Local cleanliness and removal of any bad eye habits should be attempted and persisted in. Errors of refraction should be referred to a competent refractionist for correction. The occupation of the patient as responsible for a source of irritation should be thoroughly investigated.

In securing cleanliness of the eyes, the edges of the lids should be washed with soap and water, or water and sodium borate, or solutions of hydrogen peroxide, removing all crusts without serious injury. The following is a sedative eye wash that may be used:

M. Sig.: Place two or three drops in each eye three or four times a day.

Massage of the lids is a widely used therapeutic measure in this condition. Among various ointments advised hydrous wool fat (lanolin) and 2 per cent ointment of vellow mercuric oxide have been recommended. Gentle massage by horizontal stroking movements on the closed lids with the index finger, carried from the inner to the outer angle of the palpebral fissure, is good treatment and should continue from three to five minutes. This massage relieves venous congestion. stimulates the activity of the lymphatics and increases absorption of inflammatory products. This ointment, or petrolatum, if preferred, will soften the scales and allow them to be removed, thus aiding in getting rid of the blepharitis. Such massage is best done at bedtime, when some of the ointment may be left on the lids. In the morning this may be washed off, and with it will come many of the scales. The ointment of vellow mercuric oxide seems to be a most valuable medicament for healing the lesions of this inflammation. It may be ordered as follows:

This makes 1 per cent of the ointment of yellow mercuric oxide. It should be noted that the official ointment of yellow mercuric oxide is now 1 per cent. When there is much itching of the lids, a salicylic

acid preparation may be useful:

M. Sig.: Apply as directed.

If itching is very marked Brav has recommended a tannic acid ointment, as:

In treating the ulcerative type of blepharitis, or more severe types, it may be necessary to pull out all the eyelashes before undertaking the treatment. The use of silver nitrate is advised in these severe forms, and applications are made once daily with a 1 or 2 per cent solution. Again it is urged that severe disease of the eyes be referred to an ophthalmologist, when possible.

# HORDEOLUM (STYE)

The stye is a fairly common form of eye infection. It is ordinarily a staphylococcus infection of a sebaceous follicle, around the lash, but it may occur inside the lid as an internal hordeolum or suppurating chalazion.

As the stye is primarily a staphylococcus infection, its source should be looked for in lowered resistance due to uncleanliness, general debility and errors of refraction.

Attempts may be made to abort the stye by cold applications, but ordinarily when seen it will be too far advanced for such a procedure. As in any other local infection, hot compresses may then be applied. When pus manifests its presence by a yellowish appearance the pus should be evacuated, as free an incision as necessary being made. The area may be cleaned up by a mild antiseptic washing.

If the hordeola occur in crops or tend to recur frequently, general treatment in hygienic matters is indicated. The use of autogenous vaccines may serve to create a more or less permanent cure and immunity from further attacks.

#### IRITIS

Inflammation of the iris may be acute or chronic, or primary or secondary in its origin. It may be associated etiologically with syphilis, rheumatism, tuberculosis, gout, gonorrhea, malaria, diabetes, anemia or any of the acute exanthems. Iritis seldom occurs without a

simultaneous inflammation of the ciliary body.

Besides the actual pathologic changes in the iris

Desices the actual pathologic changes in the iris and neighboring structures there are ordinarily pain, lacrimation, interference with vision and a fear of light. Ordinarily the duration of the disease is from several weeks to several months.

### TREATMENT

In the treatment of iritis both eyes should be placed at rest; smoked glasses may be worn. The patient's general condition should be improved, constipation prevented and sufficient sleep secured by the administration of hypnotics or morphine, if necessary. When the pain subsides, the patient should be in the open air as much as possible.

The primary condition associated with the ocular inflammation should be treated energetically. Syphilist, tuberculosis, gout and focal infection are all conditions which demand active scientific treatment. If a focus of infection is found it should be radicated.

The most important drug in the treatment of iritis is atropine, which should be used in sufficient dosage to produce a full physiologic effect on the pupil. In children it should be used with care to prevent poisoning. In general a 1 per cent solution may be used, of which 1 drop is instilled into the eye every hour until the pupil is dilated. Following this 1 drop every eight hours is used to secure continued action. In children a 0.5 or 0.25 per cent solution is advisable. When atropine is not well borne and causes unpleasant symptoms, the following solutions may be tried:

B Duboisinae sulphatis.... |035 or gr. ½
Aquae destillatae...... 10| fl3 iiss

M. Sig.: One drop instilled in the affected eye every eight hours.

Or:

R Scopolaminae hydrobromidi 015 or gr. 1/4
Aquae destillatae...... 8 fi3 ii

M. Sig.: One drop instilled into the affected eye three times daily.

If undesirable symptoms from the action of atropine octur, such as uncomfortable drying of the throat, palpitation, flushing of the face, and cerebral excitation, then the stronger atropines must be discarded and homatropine used.

Gm. or Cc.
B. Homatropinae hydrobromidi 40

gr. vi fl3 iiss

M. Sig.: One drop in the affected eye every hour,

Aquae destillatae..... 10

[If both eyes are inflamed, the strength of these preparations, in order for a drop to be used in each eye, must be reduced.]

During the course of the inflammation the tension of the eye must be carefully watched lest glaucoma develop, though a temporary increase in intra-ocular pressure is often seen. As soon as the eye shows increased tension, absolute rest should be ordered and the atropine stopped. If the tension does not then in a few hours decrease, physostigmine may be used:

Gm. or Cc.

B. Physostigminae salicylatis 03 or gr. 3 Aquae destillatae...... 8 ft5 i M. Sig.: One drop in the affected eye every hour.

It should seldom be necessary to have recourse to this treatment, and it is rarely necessary to employ surgery to prevent glaucoma from iritis.

The value of atropine in iritis is to dilate the pupil and thus to prevent posterior synechiae. It also contracts the iris, thus reducing congestion, and paralyzes the ciliary muscles, thus giving the iris absolute rest.

If the pain from the inflammation is not stopped by the atropine, hot moist compresses, frequently changed, should be employed. Poulties are not needed. If the deep-seated pain in the orbit continues, so as to prevent sleep, morphine must be used, and is best hypodermically.

Cocaine may be combined with atropine at times, as:

Gm. or Cc.

B. Cocainae hydrochloridi....
Atroninae sulphatis.....āā 03 or gr. ss

Aquae destillatae....... 8 fl3 ii
M. Sig.: One drop instilled into the affected eye, every three
or four hours, if necessary.

The treatment of hypopyon or posterior synechia

should be referred to a specialist.

Since it is thought that at least 50 per cent of iritis is caused by syphilis, mostly in the secondary stage, constitutional treatment during such iritis is that of the syphilis, and mercury is the important drug.

### BURNS OF THE EYE FROM LIME

This form of accident occurs quite frequently, and is ordinarily followed by grave results. The most serious and important sequel is the adherence of the lid to the globe (symblepharon) when there are two opposing raw surfaces. If the patient is seen immediately after the accident, the first step in the treatment is to drop into the conjunctival sac a few drops of a I per cent solution of phenacaine (holocaine), or of a 4 per cent solution of cocaine, in order to relieve the pain, which is usually intense, and then to remove all the remaining particles of lime as quickly as possible. The irrigating fluid should be a weak solution of vinegar, to neutralize the caustic effect of the lime. Subsequently cold applications should be applied to the closed lids, and a mild antiseptic, such as a 3 per cent boric acid solution, dropped into the eye every two or three hours. If the burn is at all extensive, the conjunctival sac should be filled with an antiseptic ointment, which not only relieves the pain but also prevents adhesion of the opposing surfaces. One of the best preparations for this purpose is a mercuric chloride ointment which consists of mercuric chloride (1:10,000) in petrolatum, Severe burns from lime, resulting in complete opacity of the cornea, have been treated-in addition to the usual local treatment-by subcutaneous injections of sodium cacodylate (from 1 to 3 grains, or from 0.065 to 0.2 Gm., at a dose) with perfect results.

After emergency treatment has been administered, if the case appears to be at all severe, the patient should be referred to a specialist.

# FLOATING SPOTS-MUSCAE VOLITANTES

The spots floating in the line of vision are not pathologic formations in the vitreous, but are shadows cast on the retina by cells in the vitreous. They have been attributed to irritation of the retina, or to congestion of

the choroid, as well as to eyestrain and to constitutional disturbances. Hypersthesia of the retina and errors of refraction have also been incriminated as causes of this condition. Complaints of these spots indicate the need of examination for errors of refraction and for improving the general condition. Generally floating spots—muscae volitantes—are not of importance. Of course, the vitreous should be examined for the presence of opacities of abnormal character.

# DISEASES OF THE EAR

Otitis Media, 714.

### OTITIS MEDIA

All kinds of bacteria may reach the middle ear, but the most frequent infections are the streptococcic and the pneumococcic. In a healthy ear the bacteria reach the tympanic avity through the ensatchian tube, and this presupposes a nasopharyngeal infection and inflammation. Obstruction at the mouths of the eustachian tubes, or swelling in the tubes, then inhibits the normal aeration of the tympanic chamber and predisposes to infection of the middle ear. Hence prophylaxis of middle ear inflammations consists in the removal of obstructive adenoids in the nasopharynx, in the removal of obstructive hypertrophies of the nasal passages so as to cause proper nasal respiration and in the correction, so far as possible, of nasal and nasopharyngeal chronic inflammations.

In acute inflammations of the nose and nasopharynx when the eustachian tubes are likely to become obstructed and bacteria are likely to reach the middle ear, a proper cleansing of the nose and nasopharynx with warm, mildly antiseptic and alkaline sprays and gargles is the proper treatment. Nasal douches as generally applied are likely to force fluid, pus and bacteria into the middle ear; in fact, a douche should never be taken through the nostrils with any but the most gentle pressure. Snuffing mild, warm, alkaline fluids through the nostrils, or gently spraying and then snuffing, or possibly the pouring of such a fluid from a spoon or small vial into the nostrils can do nothing but good and no harm to the eustachian tubes. spraying into the nasopharynx with such solutions or gargling and throwing the head forward so that the liquid washes the roof of the pharynx will also remove products of inflammation, pus and mucus from these parts and from the mouths of the eustachian tubes.

It is important to diagnose infection in the middle ear early in order that mastoid complication may be forestalled. Routine examination of the ears should be made whenever a child is ill. Complaint of pain in the ear, if present, is of course important; but young infants do not localize their pains well. A haby will cry and put his hand on the abdomen, when examination will reveal a bulging drum as the cause of the pain. Rolling the head or putting the hand to the ear are suggestive, but often have no significance. Absence of any complaint of pain or even of general restlessness is no proof that the ear is not inflamed. Temperature elevation is nearly always present, but this also, like pain, may be absent even when the drum is bulging. Tenderness in front of the ear is a reliable sign, but this, too, is occasionally lacking even when there is high temperature and bulging of the drum. Moreover, many children deny tenderness, in spite of the involuntary wincing of the mouth. Stiffness of the neck is occasionally present even without enlarged lymph nodes under the mastoid muscle and without mastoiditis. A bulging drum is of course the most important of all diagnostic signs. On examination, retraction of the drum and in addition some redness is frequently the first sign of inflammation in the rhinopharynx and often confirms a suspicion of acute rhinitis as the cause of fever up to 102 or 103 F, when there is as yet no running or stuffiness of the nose. The next sign of ear involvement is some redness along the malleus, and the next, some fulness and redness of Shrappell's membrane. These signs are present so commonly with head colds in children, and subside so readily, that this small degree of otitis can be considered a very common accompaniment of acute rhinitis. The next symptoms that appear mean an otitis media, namely, redness and bulging of the drum membrane, first behind and later in front. Occasionally the drum looks only gray, owing to thickened epithelium, which must be removed to get a view of the drum itself. The retraction meanwhile increases, and the appearance of the drum is that of a small red ring or doughnut. When accompanied by a high temperature, these signs are sufficient justification for incision of the drum. By far the larger number of such cases will subside in a day or so if the nostrils are treated by a weak epinephrine solution or if hot

irrigations of the ear are employed.

If middle ear congestion occurs the diagnosis must be made as to whether or not serum or other fluid is present. If fluid is present, as shown by bulging of the tympanic membrane and by deafness, incison of the drum must be immediately made. If no fluid is present in the tympanic cavity, but the drum shows congestioned and there is pain, the following ear drops may be to the drum shows the state of the state of

M. Sig.: Warm, and pour half a teaspoonful into the ear once in three or four hours.

M. Sig.: Warm, and pour several drops into the ear once in three or four hours. Then plug with cotton.

This fluid should be held in the ear a minute or two and then allowed to run out. The outer part of the canal is then gently dried with absorbent cotton and a plug of cotton left in the orifice.

It should again be emphasized that treatment, even as simple as the foregoing, should be used only to relieve congestion and pain. Such temporizing measures should not be used if the drum is bulging and there is fluid in the middle ear. The only treatment for this

condition is incision.

The incision or paracentesis should be done under anesthesia, though an exception may be made to this rule if the patient is an infant and only one drum is to be incised. The incision should be a J or U shape, and should be carried well upward. Irrigation with hot boric acid solutions immediately after incision is of advantage. It is always satisfactory to hear the child gulp or swallow during this irrigation, as this shows a free opening through the drum, with passage of the irrigating fluid into the throat. The temperature, the pain, the tenderness in front of the tragus, and the tenderness of the tip of the mastoid—if that has been present—should all subside after two or three days.

It is quite common, however, for the temperature to remain elevated until the discharge becomes purulent. This may be two or three days after the incision.

John A. Pratt (J. A. M. A., Oct. 25, 1930, p. 1258) recommends a dry treatment for suppurative otitis media. A small piece of cotton is laid on the tip of the first finger of the left hand; then the end of an applicator or toothoick is placed in the center of the cotton. The thumb is placed lightly over the cotton and applicator. Then, with the right hand the applicator is twirled away from one, leaving a small space between the thumb and first finger to shape the cotton. The swab on the applicator is inserted in the ear canal down to the drum and the discharge wiped out. When the canal is dry, a swab is left in the canal, and this must not touch the drum. To remove the applicator, one finger is placed on the cotton; the applicator is slightly turned in the opposite direction to loosen it and is then withdrawn. The swab should be changed as often as it is half filled with discharge, whether five minutes or five hours, the object being to suck the discharge out of the middle ear cavity as fast as it is formed.

Treatment after incision or after perforation of the drum and treatment of mastoid congestion and of mastoid inflammation, belong to the specialist. The restoration of a perfect drum and the recovery of perfect hearing after middle ear disturbance, and especially after mastoid inflammation, marks a success as great as in any branch of medicine. The general physician's duty ends when he has referred a patient with either acute or chronic ear disturbance to the specialist, and after he has impressed on his patient that the time to prevent, if possible, deafness and the danger of a possible cerebral abscess is immediately. If the patient neglects his own treatment after warnings, he has only himself to blame, but never let him be allowed the opportunity of the content of the con

blame his physician.

# GRUELS AND DIETARY SUGGESTIONS

Gruels, 718—Starchy Drinks, 720—Albuminous Drinks, 721—Bran Bread, 722.

The food value of a starchy drink during certain illnesses is considerable; also, many thin cereal liquids are soothing to patients with gastro-intestinal disturbances. With seriously ill patients a happy arrangement of a mixed diet of some milk, some beef juice, and some thin, digestible, well cooked starch makes the most appropriate food.

The following suggestions of the way such nutritions drinks should be prepared are from "Practical Dietetics," by Alida F. Pattee. For convenience, an approximate estimate of the caloric value has been added to each receipt.

#### Grueis FLOUR CRIEF

Milk																											1	cup
Flour Salt .	 				•								•			•	•	•		/	ź	t	3	Ь1	e	sp	101	onful
Raisin	 •		•	•	۰	•	•	•	•	•	•	•	•						•		•	•		•	•	1	d	ozen

Seald the milk, mix the flour with a little cold milk and stir into the sealding milk. Cook in a double boiler for one-half hour or on back of stove in sauce-pan. Stone and quarter the raisins, then add water enough to cover; cook slowly until the water has all boiled away; add to gruel just before serving, or eat with the raisins as desired. If there is much diarrhea the raisins should be omitted.

Energy value approximately 150 calories.

## BARLEY GRUEL

Blend the barley flour with a little cold milk and stir into the scalding milk. Cook in a double boiler two hours, salt to taste, and add sugar if desired; strain. Energy value approximately 650 calories.

### ARIEV CRIEF WITH BROTH

Beef b	roth																.2	cı	ıp
Barley	flour										.:	2	t	ab	le	SE	100	nf	ul
Cold v	ater										.:	2	t	ab	le	SI	100	onf	ul
Salt													1		ta	lts	no	on	fu

Mix barley flour and salt with the cold water, to form a smooth paste. Add gradually to the boiling stock and hoil one-half hour. Strain and serve very hot

### APROWROOT GRUEL

Arrowroot teaspool	niuis
Cold water 2 tablespoor	nfuls
Boiling water or milk	cup
Sugar, lemon juice or wine as required.	

Blend the arrowroot and cold water to a smooth paste, add boiling water or milk and cook in a double boiler for two hours. Add salt, strain, and serve hot, Both the barley and arrowroot may be administered

in diarrhea. Energy value approximately 150 calories.

# INDIAN MEAL GRUEL

Indian meai	tabicspooniui
Flour	½ tablespoonful
Salt	
Cold water	2 tablespoonfuls
Boiling water	
Milk or cream.	

Blend the meal, flour and salt with the cold water to make a smooth paste and stir into the boiling water. Boil on back of stove one and one-half hours, dilute with milk or cream, strain,

Energy value approximately 250 calories.

### RICE GRUEL

Rice	flo	ur		 		1	tablespo tablespo	oonful
Cold	wa	ter.		 	• • • • • • • • • • • • • • • • • • • •	2	tablespo	onfuls
Cola	пg	wat	cı	 • • • • •				quare

Mix the rice flour with a little cold water, to form a smooth paste, add the boiling water, and cook in a double boiler until transparent and thoroughly cooked. Add salt to taste, sweeten, and add milk if desired; strain.

Energy value approximately 40 calories.

#### OATMEAL GRUEL

Coarse	meal¼ cup
Salt	½ teaspoonful
	water
Milk or	cream.

Add oatmeal and salt to the boiling water, cook four or five hours in a double boiler, adding more water, if necessary. Strain, and dilute with hot milk to make it of the right consistency. Heat and serve.

Sugar may be added, if desired.
Energy value approximately 150 calories a cup.

### FARINA GRUEL

Farina Cold wa	ater .											1	ı	1	ż	ıł	)	e	25	ī	ĸ	o	01	af	ul
Boiling																									
Scalded	milk																					1		C	up
Salt.																									-

Mix the farina with the cold water, add to the boiling water and boil thirty minutes. Add the scalded milk, taste and season properly. A little sugar may be added, if desired, or an egg may be beaten and the gruel added to it.

Energy value approximately 150 calories,

# BROWNED FLOUR GRUEL

Tie ½ pound of wheat flour into a thick cloth and boil it in a quart of water for three hours. Remove the cloth and expose the flour to the air, or heat it until it is hard. Grate from it when wanted a tablespoonful, put into half pint of new milk, and stir over the fire until it comes to a boil, add a pinch of salt and a tablespoonful of cold water, and serve. This gruel is excellent for children with simple diarrhea.

# Starchy Drinks

### BARLEY WATER

Pearl barley	tablespoonfuls
Cold water	1 quart
Salt	enough

Wash the barley, add cold water, and let it soak several hours; drain and add the fresh cold water, boiling gently (over direct heat for two hours) down to 1 pint, adding water from time to time; salt to taste, and strain through muslin. Cream or milk may be added, or lemon juice and sugar. This makes a demulcent drink, slightly constipating.

### RICE WATER

Rice			2	tablespoonfuls
Cold	water			1 pint
Boili	ng water	or hot	milk	enough
Salt				enough

The carefully washed and cleaned rice should be added to the cold water and cooked an hour, or until the rice is tender. Strain, and dilute with the boiling water or hot milk to the desired consistency, and season with salt. Sugar or cinnamon may be added, if desired or advisable.

### OATMEAL WATER

Oatmeal			 								1	tabl	espe	oonfu
Cold was	er										1	tabl	espo	onfu
Salt				٠.	٠.			٠.	 	 			a	littl
Boiling '	wat	er.	 			٠.							1	quar

Mix the oatmeal and cold water, add the salt, and stir into the boiling water. Boil three hours, adding water as it boils away. Strain through a fine sieve or cheesecloth, season, and serve cold.

# TOAST WATER

Stale bread,	toasted	. I cup
Boiling water	er	.1 cup
Salt		enough
		-

Dry in an oven thin inch squares of the bread until crisp and brown. Take a cupful of this toast broken into crumbs, add water, and let it stand one hour. Strain through cheesecloth, season, and serve hot or cold. If desirable, milk or cream and sugar may be added.

# Albuminous Drinks

## EGG BROTH

Yolk of egg		
Sugar	1 tablespoonful	
Salt	1 speck	
Hot milk	1 cup	

After beating the egg, add the sugar and salt, and then pour on the hot milk.

Energy value approximately 230 calories.

### AURUMINIZED MILK

Milk																			
White Salt.	of	egg	 		 ٠.	-				٠		-	•	•	•	٠		٠	1

Flavoring.

Place the milk and egg in a covered glass fruit jar, shake until thoroughly blended, salt and flavor as desired. Strain and serve immediately.

Energy value approximately 150 calories.

### Bran Bread

Wheat flour2 cups
Graham flour2 cups
Bran flour2 cups
Salt1 teaspoonful
Sugar½ cup
Baking powder l teaspoonful
Milk2 cups
Molasses1 cup
Egg
Soda 2 teaspoonfuls
Hot water¼ cup
Raisins1 cup

Thoroughly mix the foregoing liquid and solid ingredients, and bake in a moderate oven for one hour.

This makes two loaves.

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